A REVISION OF AMERICAN SIPHONAPTERA, OR FLEAS, TOGETHER WITH A COMPETE LIST AND BIBLIOGRAPHY OF THE GROUP.

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INTRODUCTION.

The present work was begun in 1890 at the suggestion of my friend and former teacher, Prof. A. J. Cook. His advice then was that usual to the thorough-going scientist, not to publish until some phase of the work had reached completion so far as circumstances permitted. At that time nothing whatever had been done on the group in America in a systematic way. It was supposed that this fact would make the taxonomic work at least "plain sailing." But the condition of the group in Europe had not been reckoned with. However, anatomical studies were begun and an attempt made to get together material and the literature. It was found that few collections contained more than an occasional dog flea, and the literature proved to be more extensive than was supposed.

The impossibility of finding names for more than a very few of the species attracted attention to the need of systematic work very early, and an attempt was made to classify the few species then in the collection. This work was based on Taschenberg's Die Flöhe, and the results were published in 1895 as Preliminary Studies. It was evidently a step in the right direction, for while many of the results were merely tentative, yet it attracted much attention to a badly neglected group, and material came in much more rapidly afterward and from many quarters. Here should be mentioned particularly those whose interest in the subject has made possible our far fuller present knowledge of the American species:

Prof. J. M. Aldrich, Moscow, Idaho; Dr. C. Berg, Buenos Ayres, Argentina; Prof. Lawrence Bruner, Lincoln, Nebraska; Prof. A. B. Cordley, Corvallis, Oregon; Dr. A. Dugès, Guanajuato, Mexico; Mr. Edward Ehrhorn, Mountain View, California; Dr. A. K. Fisher,

Department of Agriculture, Washington City; Dr. J. Fletcher, Ottawa, Canada; Prof. C. P. Gillette, Fort Collins, Colorado; Dr. L. O. Howard, Washington City; Rev. J. H. Keen, Masset, Queen Charlotte Islands; Dr. A. Lutz, São Paulo, Brazil; Mr. G. S. Miller, jr., U. S. National Museum, Washington City; Prof. A. P. Morse, Wellesley, Massachusetts; Prof. Herbert Osborn, Columbus, Ohio; Mrs. A. T. Slosson, Franconia, New Hampshire; Mr. J. O. Snyder, Stanford University, California; Mr. H. F. Wickham, Iowa City, Iowa; Mr. D. B. Young, Newport, New York.

The late Professors Harvey and Hubbard also made valuable contributions. I do not believe that too much credit can be given those who are active collectors in biological work or who inspire active accumulation of material.

Having already become convinced of the inadequacy of the Taschenberg classification the work of Wagner came as no surprise. It, together with the considerable accumulations of new material, made imperative a revision of the American species. It was hoped this time to make the work far more complete, embracing some comparative morphological and embryological studies, which are much needed. The work as laid out would have been sufficient to consume the time available for such work during three years. Unforeseen contingencies made it imperative that work on this subject for the time being should be confined to one year or less. The logical course under the circumstances being the completion of work already in progress, the following paper, relating only to the taxonomy of the group, is presented as the direct result of part of one year's work (1902).

I have Dr. Kellogg to thank for a place to work during my stay at Stanford University.

The plates were all prepared by the author.

The paper is based upon material in the United States National Museum and all of the types are deposited in that Museum. The names of hosts have been revised by Mr. Gerrit S. Miller, jr. Concordance between the current nomenclature and the names used by previous writers on fleas is established in the list of Siphonaptera of the World (pp. 433 to 457), where the former will be found under the special heading *Hosts*, and the latter are given after the references in the synonymy.

HISTORY.

The history of the Siphonaptera, taxonomically speaking, begins with the recognition of *Pulex irritans* in 1746 and of *Pulex penetrans* in 1767. In the following years various scattering descriptions of species and notes on anatomy and affinities were given by Bosc, Dugès, Westwood, Bouché, Haliday, and others, until 1857 when the Siphonaptera received their first systematic treatment at the hands of

Kolenati. In his Die Parasiten der Chiropteren, Kolenati describes six species of *Ceratopsyllus* and one of *Pulex*, parasitic on bats, placing them in the Diptera under Latreille's group Phthiriomyiæ. A similar account of the bat fleas was also published the same year by the same author in the Wiener Entomologische Monatsschrift.

In 1863 appeared Kolenati's epoch-marking Beiträge zur Kenntnis der Phthiriomyiarien, in Horæ Societæ Entomologicæ Rossicæ. On this work our modern classification of the Siphonaptera is largely based. It includes, besides the treatment of this group, also a monograph of the parasitic flies of the families Nycteribiidæ and Streblidæ.

Some of Kolenati's work is difficult to decipher on account of the very meager descriptions and the extremely poor illustrations presented. Fortunately, some of the specimens on which his work was based still exist in St. Petersburg, where they have been studied by Dr. Wagner with very important results. Kolenati used eight generic names, of which we now apply six to valid groups. For many years this work remained the most complete systematic account of the group.

Between the years 1860 and 1880 but little was done on systematic work, collecting, and comparative studies. But during that period there appeared several monumental anatomical papers which have done much toward raising the standard of work in the group and dignifying the study of these very remarkable but much despised insects. Notable among these are Karsten's study of *Sarcopsylla penetrans*, Landois' anatomy of the dog flea, and Berté's careful work on the antennæ of fleas. During this period also we first have careful studies of the habits and development of fleas.

In 1880 appeared the second epoch-marking monograph of the group by Dr. Otto Taschenberg. This was intended to be a summary of everything known on the group, together with a systematic rearrangement of the species, and with carefully drawn figures of each species. Dr. Taschenberg recognized 2 families and 5 genera, and lists 33 species, most of which he considers valid.

The period from 1880 to the present time has been one of great activity in the study of this group, as was to be expected after the work of Karsten, Landois, Berté, Kraepelin, and Taschenberg. Besides numerous scattering papers, we have the very important contributions, both anatomical and systematic, first of Wagner and later of Rothschild. The results from these two authors represent the highest grade of work yet done on the group, and give promise of as complete and scientific treatment as has been given any group of animals.

HABITS.

An excellent summary of the breeding habits of the cat and dog flea has been given in Bulletin No. 4, n. s., Division of Entomology, 1896.

That article relates to the larval and pupal stages and the conditions under which they live. These facts will not be restated here, as we have nothing new to add, but there are certain other aspects of the habits of fleas which very much need a fuller discussion.

In recent discussions of the relations of parasitic and other insects to the transmission of disease, much space has been given to flies, especially mosquitoes, and but little to fleas. While as a matter of fact the latter may be of even greater importance, not only because of their more insidious attacks, but also because of their association with some of the most terrible diseases.

The whole matter rests upon the host relations of the various species. It is a well known fact that the cat and dog flea will take very readily to the human being. It is to be noted that the cat and dog flea is closely related to *Pulex irritans* and similar to it in the more important details of structure. Some of the rabbit fleas, which are likewise closely related to *P. irritans*, will also readily attack the human being, which I had occasion to learn as a youth. While these fleas will remain on a human being for some little time and bite frequently while there, still they do not habitually frequent that host and his clothing and bed as does *P. irritans*.

Among closely related animals or animals of very similar habits one species of flea may have a number of normal hosts. But our knowledge of this matter is exceedingly fragmentary and uncertain. Cases of temporary hosts being as common as they are, it becomes very probable that many of our records refer merely to the temporary host. A rabbit running into a badger hole, a mouse into a mole burrow, an owl eating a mouse, a cat devouring a rat—these and many other fortuitous circumstances furnish conditions favorable for at least temporary transference. I have referred to a number of these cases in the account of the separate species.

The character of the hair and thickness of skin was at first considered as controlling the range of parasites, due to the close relation these conditions must have to the structure of the flea, especially the length of mouth parts and covering of bristles. Exceptions were soon found to this rule, though in general such relations may be said to exist.

Excluding the accidental records on carnivorous animals, we may say that in the United States the cat, dog, and rabbit fleas are closely related to *P. irritans* and will readily attack the human being, while the mouse, rat, squirrel, mole, and shrew fleas are not closely related to *P. irritans* and have never been known to bite the human being. Mr. F. H. Chittenden wrote me that he believed rat fleas sometimes bit human beings in Washington, but he has not yet verified this statement by the actual capture of specimens in the act. Nor do I know of any such records.

South of the United States conditions are wholly different, and present an aspect of considerable economic importance, for here we

find fleas of the genus *Pulex* much more nearly related to *P. irritans* than even the cat and dog flea, living on rats and mice and other small rodents. Dr. Dugés had found, a number of years ago, one such species to be abundant on a spermophile in Mexico. Later I had several letters relative to this matter from Dr. Lutz, director of the bacteriological laboratory at Sao Paulo, Brazil. He outlined briefly the importance of the facts to be determined, and sent material of the greatest significance—typical *Pulex* from rats and mice. We shall look with great interest for the full elucidation of this subject by the experimental work from Dr. Lutz's laboratory.

As to the other tropical regions we know practically nothing. I have no records of fleas from India. However, from Asia north of India come true *Pulex* from the smaller rodents, and from the island of Socotra we have *Pulex pallidus* described as occurring on *Mus albipes*, so that we may expect to find true *Pulex* on rats in the Indian region.

ANATOMY.

The classical works of Karsten, Landois, and Berté covered the gross anatomy of the Siphonaptera very fully. It has remained, however, for Wagner and Rothschild to examine into the more minute details and more especially from the comparative point of view. Indeed, in comparative anatomy the work has just begun. The facts relative to the anatomy of fleas will not be recapitulated here as they are referred to extensively in the accounts of families, genera, and species. It may be well, however, to refer to certain special usages in the classification of the group.

Kolenati paid almost no attention to chætotaxy in his works, sometimes scarcely giving a clear account of the ctenidia. Taschenberg was far clearer in that respect. Wagner and Rothschild have attached to it an importance equaling that it bears in the Diptera, and very properly so. In the present paper the term "spines" is applied to the ctenidial armature, and to the larger members of the leg and body armature; those of medium size are termed bristles and this includes most of the body armature; the finest and flexible ones are termed hairs. A few minute teeth often occur on the hind margins of some of the dorsal segments. Some of the bristles are, in general, very constant in position, notably those on the genæ, hind margin of head, and abdominal segments, except the last. Others are very variable in position among the various species and consequently very useful in classification, especially those on hind margin of antennal groove, vertex (this term here applied to that portion of head back of antennal grooves), last abdominal segments, genital organs, femora, tibiæ, and last joints of tarsi. The number of ctenidial spines on the head is usually very constant in any one species, while the number of spines

in thoracic or abdominal ctenidia is quite likely to vary two or even four in some species, especially in those species in which the ctenidia are laterally reduced.

The exact homologies of the genital organs have yet to be worked out, though Rothschild has taken a long step in the right direction. In the present paper the terms "lateral portion of ninth tergite" and "tenth tergite" are used as applied by Rothschild. The upper and most conspicuous pair of genital appendages are called "upper claspers" and the paired organs, immediately below these, but more inconspicuous and retractile, "lower claspers."

Of the later authors each has had a different method of stating the comparative lengths of the tarsal joints. It is a matter in which minute exactness is not only undesirable but impracticable, owing to the unevenness of the ends of the joints. In the present paper the proportion is given in terms of the fourth joint, which is given the empirical value of 5, due to its great similarity in size in the different legs and in different species. The measurements were taken by a camera lucida and the results reduced to the terms mentioned above. In the author's practice this has greatly simplified the comparison of species.

It may be noted that the rather strongly chitinized seminal vesicle in the females, which retains its shape after treatment with caustic potash, possesses a very characteristic form in many of the species. After mounting, it rests in various positions and this makes its comparative study very difficult.

CLASSIFICATION.

Linnæus began with one genus, *Pulex*, and one species, *irritans*, which will represent the type of *Pulex* always. Linnæus afterwards described *P. penetrans*. The first separation of *penetrans* as a distinct genus occurred in 1815[a] under the name *Rhynchoprion*. I do not know why this name has been rejected. If there is no question as to its application, then it must be used instead of *Sarcopsylla* and the family name will also change.

The dismembering of *Pulex* began in 1832 with the *Ceratophyllus* of Curtis, and seven generic names were proposed by Kolenati. Most of these names represented somewhat artificial groups and were poorly defined. The reaction came with Taschenberg, who disregarded all the latter genera and returned to the Linnæan *Pulex* for the greater portion of the species. Taschenberg is not, however, altogether consistent, although one can readily understand why he was tempted to reject all the inadequate work of his predecessors. However, Taschenberg describes *Hystrichopsylla* and establishes a new genus, *Typhlopsylla*, for three groups combined, each of which had previously received a generic name.

[a] Oken, Naturg. f. alle Stände, III, p. 402.

The Siphonaptera seem to have suffered especially from the disregard of all laws of priority. *Rhynchoprion* and *Hectopsylla* were disregarded and new names given the same groups. Species names were discarded for all sorts of reasons, often simply because they were more or less inappropriate. In this paper the attempt has been made to apply the rules of priority strictly, though it has been impossible to investigate fully such special cases as *Rhynchoprion*, *Monopsyllus*, etc.

No writer on the fleas in the past has made any attempt to designate generic types, and this fact has given rise to the greatest difficulties. I have tried to determine this matter for all the genera, and the results are given below for the Pulicidæ. With the other, later genera, there is no difficulty.

Pulex Linnæus 1695; type, *irritans* Linnæus.

Ctenocephalus Kolenati 1859; type, *canis* Curtis (*canis* = *norvegicus* Kolenati).

Ceratophyllus Curtis 1832; type, *gallinæ* Schrank. = *Ctenonotus* Kolenati 1863; type, *fasciatus* Bosc (*fasciatus* = *octodecimdentatus* Kolenati). = *Trichopsylla* Kolenati 1863; type, *penicilliger* Grube.

Ctenophthalmus Kolenati 1863; type, *bisoctodentatus* Kolenati.

Ctenopsyllus Kolenati 1863; type, *musculi* Duges (*musculi* = *quadridentatus* Kolenati).

Ceratopsyllus Kolenati 1863; type, *pentactenus* Kolenati = *Typhlopsylla* Taschenberg 1880; type, *octactenus* Kolenati.

Penicilliger, *fasciatus*, and *gallinæ* are clearly congeneric. Taschenberg does not especially indicate a type for *Typhlopsylla*, but no matter which is taken for the type the genus becomes synonymous with some other. I have indicated the first species under his genus as the type, thus throwing it into *Ceratopsyllus*. The two others of the three groups in Taschenberg's *Typhlopsylla* fall into *Ctenopsyllus* and *Ctenophthalmus*, respectively. It is to be noted that Wagner and Rothschild still use *Typhlopsylla* for the same group to which the earlier name *Ctenophthalmus* was applied. *Ctenophthalmus* and some of the other genera may be artificial groups, but *Typhlopsylla* is still more so, founded as it was principally on the absence of eyes. This character has proven of scarcely more than specific value, every possible gradation occurring from *Pulex* to *Ceratopsyllus*.

On the other hand, it is certain that Wagner's reseparation and recharacterization of these genera will have to be much modified, due to reasons which are dilated upon in the discussions of genera.

The synopsis used herein has been adopted simply as a matter of expediency in the study of the American species, as it was impossible to separate them either according to the scheme of Taschenberg or of Wagner. So the two have been combined.

One hundred and thirty-five species are listed in this paper for the world. I have not the least doubt but that many hundreds will eventually be found, and that these will fall into at least twenty-five or thirty

clearly defined generic groups. As it is, every new lot of specimens which comes in changes one's idea of the existing genera, making very evident the great danger in a too rapid increase of generic divisions. Species are now pouring into the collections in great numbers. Where large series from all over the world can be gathered together, there, within the next few years, must be accomplished the total recasting of the whole group on largely new and original lines. Logically this should be done at St. Petersburg, where the types of Kolenati and a large additional collection are to be found under the care of our most experienced siphonapterologist, and to him we relegate this work.

SYSTEMATIC ARRANGEMENT AND DESCRIPTION OF AMERICAN SPECIES.

Order SIPHONAPTERA Latreille.

1798. Schellenberg, Helvetische Entom., I, p. 15 (*Rophoteira* pt.).
1801. Lamarck, Syst. d. Anim. s. Vert., p. 313 (*Aptera* pt.).
1805. Latreille, Hist. nat. des Crust. et des Insect., XIV (*Suctoria*, preoc.).
1825. Latreille, Fam. nat. du Règne Animal (*Siphonaptera*).
1826. Kirby and Spence, Introd. to Entom., IV (*Aphaniptera*).
1840. Westwood, Introd. to Mod. Class. of Ins., II, p. 488 (*Aphaniptera*).

Body of adult, except in some gravid females, strongly compressed. Thorax composed dorsally of three separate, entire, simple, subequal sclerites.

Mouth parts suctorial, consisting of stylate hypopharynx and mandibles resting between 1–13 jointed labial palpi; outside of these are usually laminate maxillæ with four-jointed palpi; labrum and clypeus not distinctly separated.

Eyes usually present as simple pigment masses in a chitinous framework on anterior border of antennal groove.

Antennæ immersed in grooves, three-jointed, the third joint with usually 9 more or less completely separated pseudojoints.

Wings entirely absent. Metanotum on either side with a rounded epiphysis which is connate with the first abdominal segment.

Tarsi five-jointed. The coxa is usually the longest joint of the leg and the trochanters are well developed. The middle and posterior coxæ usually have a foliaceous epiphysis on posterior border.

Alimentary canal composed of a slender œsophagus, a suboval proventriculus which is lined with numerous chitinous ridges which may project as free teeth, an elongate saccate stomach at the base of which are four slender malpighian tubules, and a rectum provided with tracheated glands.

Larva footless, with a well-developed head which possesses biting mandibles, rudimentary maxillæ, a well-formed labrum, and three-jointed antennæ.

Pupa inactive, but with free legs, and sometimes at least resting within a cocoon.

Imago parasitic on mammals and birds. Larva free-living, subsisting on dead organic matter.

SYNOPSIS OF FAMILIES.

a. Thoracic segments strongly shortened and constricted; labial palpi without pseudo articulations; third joint of antennæ without clearly separated pseudojoints.

b. Maxillæ without or with very short and broad projecting laminæ, their palpi extending beyond anterior coxæ; head strongly angulated anteriorly in both sexes; metathoracic epiphyses extending over nearly two or even three abdominal segments; the female becoming endoparasitic when gravid, with globose, enormously dilated abdomen, in which the original chitinous sclerites are mostly obliterated ..... SARCOPSYLLIDÆ (p. 373).

bb. Maxillæ with a long, narrow, curved lamina which projects downward and backward, their palpi equaling the anterior coxæ; head evenly rounded in both sexes; metathoracic epiphyses extending over but one abdominal segment; gravid female with abdomen vermiform .... HECTOPSYLLIDÆ (p. 375).

aa. Thoracic segments not strongly shortened and constricted, their epiphyses extending over but one abdominal segment; labial palpi with three or more pseudojoints; maxillary palpi almost always shorter than anterior coxæ; third joint of antennæ with nine more or less distinctly separated pseudojoints.

b. Labial palpi with 11–13 pseudojoints; abdomen of gravid female much swollen; antepygidial bristles absent ..... VERMIPSYLLIDÆ (p. 376).

bb. Labial palpi with 3–5 pseudojoints; antepygidial bristles always present.

c. Fore tibiæ armed on posterior border with few, single, very large, black teeth; fifth tarsal joint greatly enlarged, those on forelegs as long as rest of tarsus, on all legs with the claws nearly as long as the fifth joint; fore coxæ nearly nude, with but few long spines; body of gravid female considerably swollen ..... MEGAPSYLLIDÆ (p. 376).

cc. Fore tibiæ armed on posterior border with slender spines; fifth tarsal joint never greatly enlarged, never as long as rest of tarsus; the claws shorter; fore coxæ always clothed on outside with several to numerous oblique rows of bristles; body of gravid female never swollen so as to expose extensive areas of connective membrane ..... PULICIDÆ (p. 377).

Family SARCOPSYLLIDÆ Taschenberg.

1880. TASCHENBERG, Die Flöhe, p. 43.
1895. BAKER, Canad. Ent., XXVII, p. 20.

This is the most highly specialized family of the order. The reduced condition of the maxillæ, labial palpi, third joint of antennæ, thorax, and coxæ are distinctive.

SYNOPSIS OF GENERA.

a. Maxillæ without projecting lamina; angle of head produced; metathoracic epiphyses of great size, extending over three abdominal segments; fifth tarsal joint without lateral heavy spines, and rest of legs almost spineless.
Sarcopsylla (p. 374).

aa. Maxillæ with a very short and broad projecting lamina; angle of head not produced; metathoracic epiphyses of medium size, extending over scarcely two abdominal segments; fifth tarsal joint normally armed, as are also the other joints of the legs ..... *Neostopsylla* (p. 374).

Genus SARCOPSYLLA Westwood.

1815. *Rhynchoprion* Oken, Naturgesch. f. alle Stände, III, p. 402.
1829. *Dermatophilus* Guérin, Iconograph. d. règne animal. Insects, p. 12.
1836–40. *Sarcopsylla* Westwood, Trans. Ent. Soc. Lond., III, p. 199.
1862. *Sarcopsylla* Kolenati, Horæ Soc. Ent. Ross., II, p. 28.
1880. *Sarcopsylla* Taschenberg, Die Flöhe, p. 44.
1895. *Sarcopsylla* Baker, Canad. Ent., XXVII, p. 20.

SARCOPSYLLA PENETRANS Linnæus.

There seems to be little doubt that as this name has been used, it is a composite species—an aggregate of several distinct forms. All forms having females with the peculiar habits of the original *penetrans*, have been previously referred to this species without question and usually without study. For the proper study of a species in this genus the student should have especially the male and the free female. The encysted female is of comparatively little value, and this is especially true of the material usually preserved in collections in which head, legs, and thorax are very likely to be torn away in consequence of lack of care in the removal from the cyst. It is probable that the common form of the American tropics which attacks the domestic animals and man is to be regarded as the true *penetrans*.

But a variety of wild animals which never associate with the domestic, possess similar forms, and the males and free females of these should be carefully collected and studied. Westwood notes that Pohl and Kollar consider the Bicho de Cachorro or dog chigoe distinct from the Bicho de pie or *S. penetrans*.

Variously known as Jigger,[a] Chique, Chigoe, Tique, Bicho, Pico, Pique, Sico, Tschike, Nigua, Tunga, Tû Ton, Tûngay or Aagrani (see Taschenberg), *S. penetrans* (sens. lat.) is a troublesome pest in some parts of Mexico, West Indies, and Central and South America, as well as in some tropical regions elsewhere. There is no authentic record of its occurrence within the borders of the United States, though it may be expected in Florida and southern Texas. In attacking man it seems to generally affect the feet, getting under the toe nails and producing painful sores which become serious by neglect. A sharp knife point and an antiseptic wash furnish the required treatment.

Genus XESTOPSYLLA, new genus.

Type, *Sarcopsylla gallinacea* Westwood.

This form seems so out of place in Sarcopsylla that it is here separated as a distinct genus. It differs from *S. penetrans* very widely in structure.

[a] This name is commonly applied in the United States to our very troublesome red mite.

XESTOPSYLLA GALLINACEA (Westwood) Baker.

This species was first described from Ceylon, but the common hen flea of our Southern States, which was undoubtedly introduced, appears to be the same thing. It is a common pest from Florida to Texas. It was also found in large numbers on horses at Orangeburg, South Carolina. Perhaps a near-by hen roost would explain this latter occurrence. The collection does not contain specimens from outside the Southern States.

Judge Lawrence C. Johnson presents a very full and interesting account of the habits of this insect.[a] He says it affects not only hens, but turkeys, cats, dogs, cattle, horses, and children. He also gives the first lucid account of the exact manner in which encystment takes place. This matter was formerly dismissed with the statement that the insect "burrowed into" or "penetrated" the skin. Judge Johnson says that the great irritation produced by the female fastening itself at one spot finally produces a surrounding welt or tumefaction which closes over it, though the inclosure is apparently never wholly complete.

Family HECTOPSYLLIDÆ, new family.

The genus Hectopsylla is here separated as constituting a group equivalent in value to the other families. In some respects it is the most remarkably distinct group of the order.

Genus HECTOPSYLLA Frauenfeld.

1860. *Hectopsylla* Frauenfeld, Artzungab. d. k. Acad. d. Wiss. Wien, XL, p. 462.
1880. *Rhynchopsylla* Haller, Archiv. f. Naturgesch. Jahrg., XLVI, p. 72, pl. iv.
1880. *Rhynchopsylla* Taschenberg, Die Flöhe, p. 56.
1895. *Hectopsylla* Baker, Canad. Ent., XXVII, p. 21.

If, as Taschenberg indicates, there can be no question as to the identity of Rhynchopsylla and Hectopsylla, then there can also be no question as to which name we must use.

HECTOPSYLLA PSITTACI Frauenfeld.

This remarkable insect was first described from Ceylon as occurring on a parrot (*Psittacus* sp.). Later it was also found on an alcoholic specimen of a *Nyctinomus*. One of the two occurrences was probably accidental, but which, remains to be determined. Except for the reports of Frauenfeld and of Haller, it has remained unknown, though it may not be infrequent on its proper host.

[a] Proc. Ent. Soc. Wash., I, p. 59.

Family VERMIPSYLLIDÆ Wagner.

1889. *Vermipsyllidæ* Wagner, Horæ Soc. Ent. Ross., XXIII, No. 1-2, p. 205.
1895. *Vermipsyllidæ* Baker, Canad. Ent., XXVII, p. 22.

This family is characterized especially by the extreme development of labial palpi.

Genus VERMIPSYLLA Schimkewitsch.

1885. *Vermipsylla* Schimkewitsch, Zool. Anz., No. 87.
1889. *Vermipsylla* Wagner, Horæ Soc. Ent. Ross., XXIII, Nos. 1-2, p. 205.
1895. *Vermipsylla* Baker, Canad. Ent., XXVII, p. 22.

Contains but one species (*V. alacurt* Schimkewitsch). Found only on Ungulates in Turkestan.

Family MEGAPSYLLIDÆ Baker.

1898. *Megapsyllidæ* Baker, Journ. N. Y. Ent. Soc., IV, p. 53.

Recognizing the remarkable distinctness of the *Pulex grossiventris* of Weyenberg from any Pulicidæ, it was referred to in the Preliminary Studies as a good species of *Sarcopsylla*. Later, a study of specimens kindly sent by Dr. Berg, of Buenos Ayres, showed this to be a very erroneous reference, the species really being a much closer relative of *Pulex*. As it represented a group equivalent to Vermipsyllidæ, or Sarcopsyllidæ, it was made the type of a new family. The fifth tarsal joint is very closely inserted into the fourth, and beneath the apex of that joint, this giving the subconnate appearance as described. The enormous claws and spines of fore tibiæ are distinctive. In the somewhat reduced maxillæ it resembles the Sarcopsyllidæ, but the female abdomen does not become swollen to the extent found in the Sarcopsyllidæ or even in the Vermipsyllidæ.

Genus MEGAPSYLLA Baker.

1898. *Megapsylla* Baker, Journ N. Y. Ent. Soc., IV, p. 53.

Head evenly rounded above in female; uneven and unituberculate in front in the male. Prothorax in the female with five or seven remote, short, stout, dark-brown teeth; in the male unarmed. Fore tibiæ very small and short, but swollen. Maxillæ small, extending only to one-half of second joint of maxillary palpi. Labial palpi 5-jointed.

MEGAPSYLLA GROSSIVENTRIS (Weyenberg) Baker.

Lives on *Zaëdyus minutus* in Argentina. One of the largest (male, 2.5–3.25 mm.; gravid female, 6–6.5 mm.) and most distinctly marked of the known fleas.

Family PULICIDÆ Stephens.

1829. *Pulicidæ* Stephens, Syst. Cat. British Insects.
1880. *Pulicida* Taschenberg, Die Flöhe, p. 62.
1895. *Pulicida* Baker, Canad. Ent., XXVII, p. 20.

As used by Stephens for the British species, this is its first application to that group of which the genus *Pulex* is the type genus.

TABLE OF GENERA.

a. Maxillæ long triangular, acute at apex.
b. Abdominal tergites never with ctenidia.
c. Posterior tibial spines in pairs and not in a very close-set row.
d. Last tarsal joint on all the tarsi with a marginal row of four stout spines on each side beneath; eyes always large and well developed; hind coxal epiphysis narrowing distally into the coxa, forming a poorly defined notch or none; female with but one antepygidial bridle on each side.
e. Head without ctenidia ..... *Pulex* (p. 378).
ee. Head and prothorax with ctenidia ..... *Ctenocephalus* (p. 384.)
dd. Last tarsal joint with five pairs of stout spines beneath, at least on anterior tarsi; sometimes only four on middle or hind tarsi and then eyes wanting.
e. Maxillary palpi rarely extending to half or three-fourths of anterior coxæ; prothorax with a ctenidium; hind coxal epiphysis forming distally with the coxa a shallow notch; female with three antepygidial bristles on each side.
f. Head without ctenidia; eyes usually well developed.
Ceratophyllus (p. 385).
ff. Head with ctenidia; eyes usually very rudimentary.
Ctenophthalmus (p. 420).
ee. Maxillary palpi exceeding anterior coxæ; eyes totally wanting; head and prothorax without ctenidia; hind coxal epiphysis forming distally with the coxa a deep notch, subtended outwardly by a produced acute limb; female with one antepygidial bristle on each side.
Anomiopsyllus (p. 425).
cc. Posterior tibial spines mostly single and in a close-set row; face sloping down and back from the forehead, thus the whole head more or less conical; eyes wanting.
d. Head of female without a cap-like patella in front, but with or without nearly perpendicular ctenidia on genæ; the normal female with three or four antepygidial bristles on each side ..... *Ctenopsyllus* (p. 426).
dd. Head of female with cap-like patella armed with a ctenidium on its posterior border; genæ with subperpendicular ctenidia; mandibles extremely slender; female with but one antepygidial bristle on each side ..... *Stephanocircus* (p. 430.)
bb. Abdominal tergites with one or more ctenidia; posterior tibial spines in numerous, short, close-set transverse rows on posterior border, with about four spines in each row; female with four antepygidial bristles on each side ..... *Hystrichopsylla* (p. 432).
aa. Maxillæ clavate or subquadrangular; face strongly sloping forward and recurved just above the mouth, where there are two tooth-like plates on each side; eyes absent; pronotum and usually abdomen with ctenidia; confined to bats ..... *Ceratopsyllus* (p. 432).

Genus PULEX Linnæus.

1758. *Pulex* Linnæus, Systema Naturæ, 10th ed., I, p. 614.
1840. *Pulex* Westwood, Introd. to Mod. Classif. of Ins., II, Gen. Synop., p. 124.
1857. *?Monopsyllus* Kolenati, Wiener Entom. Monats., I, p. 65.
1863. *Pulex* and *Trichopsyllus* Kolenati, Horæ Soc. Ent. Ross., II, p. 29.
1898. *Pulex* Wagner, Horæ Soc. Ent. Ross., XXXI, p. 21.

Though *irritans* is the type of this genus, still we have included three species possessing pronotal ctenidia. In one of these, however, the number of spines is unusually reduced, showing a transition in this respect toward *irritans*.

SYNOPSIS OF AMERICAN SPECIES.

a. Prothorax without ctenidial spines.
b. Abdominal tergites with but one distinct transverse row of bristles, and without minute teeth; inner side of hind coxa distally with an oblique row of minute teeth; vertex without transverse rows of bristles; hind margin of antennal groove with a few weak hairs.
c. Teeth on inner side of hind coxa numerous and in an irregular row; labial palpi apparently 3-jointed; fifth tarsal joint without minute hairs on disk.
d. Labial palpi extending about one-half the length of anterior coxæ. *irritans* (p. 379).
dd. Labial palpi extending three-fourths the length of anterior coxæ or more ..... *dugesii* (p. 379).
cc. Teeth on inner side of hind coxæ six in number and in a regular row; labial palpi as long or longer than the anterior coxæ, and apparently 4-jointed; fifth tarsal joint with minute hairs on disk ..... *brasiliensis* (p. 379).
bb. Abdominal tergites with two distinct rows of bristles; hind margin of metanotum, and first, second, and third tergites with small teeth; inner side of hind coxæ without minute teeth; vertex with two transverse rows of bristles; hind margin of antennal groove with a close-set row of numerous minute teeth.
c. Abdominal tergites all with a second row of numerous small bristles; hind margin of antennal groove with about a dozen minute teeth; maxillary palpi with second and fourth joints nearly equal and longer than the first, which is longer than the third; first three abdominal tergites with minute teeth, the first with about 11 on each side, the last with about three on each side; hind tibiæ with spineson hind margin short and weak and with many short bristles on the outer side in several longitudinal rows ..... *bohlsii* (p. 380).
cc. Abdominal tergites without a distinct second row of bristles excepting on first two, the remainder with but one or two bristles on each side in place of second row; hind margin of antennal groove with a thick-set row of about 25 minute but well-developed teeth; maxillary palpi with first and third joints nearly equal and second longer than fourth; first abdominal tergite only with minute teeth; hind tibiæ with long, strong spines on the hind margin and about eight stout bristles on the outer side ..... *lutzii* (p. 380).
aa. Prothorax with a ctenidium.
b. Pronotal ctenidium with about 9 spines ..... *anomalus* (p. 381).
bb. Pronotal ctenidium with about 17 spines.
c. Vestiture of spines and bristles rather heavy; a spine on hind distal angle of second joint of hind tarsi as long as joints 3 and 4 and three-fourths of 5 together; upper male claspers short and stout, lower claspers shaggy, with hairs ..... *affinis* (p. 382).
cc. Vestiture comparatively light; a spine on hind distal angle of second joint of hind tarsi as long as joints 3 and 4 and scarcely one-fourth of 5, together; upper male claspers long and slender, lower claspers with few hairs. *lynx* (p. 383).

PULEX IRRITANS Linnæus.

Plate XI, figs. 3–6.

This, the earliest described member of the order, is the best known species of the world next to the cat and dog flea, and appears to be nearly cosmopolitan in the warmer temperate and in the tropical regions. It is the specific flea of human beings, but it will readily attack a variety of other animals which may happen in its way, as a transient parasite. It is common in dwelling houses within its range, and is also common in other places frequented by human beings, like parks, picnic grounds, and sea beaches. The collection contains specimens from California, Queen Charlotte Islands, Texas, and the Southeastern States. It has been taken from *Didelphis virginiana* (this form the variety *simulans*), and Mr. J. O. Snyder contributes specimens taken on a fox at San Diego, California. Both of these latter occurrences are to be considered as accidental.

PULEX DUGESII Baker.

First described as a variety of *irritans*, this form is now given the rank of a species. The examination of a large series shows the characters to be uniform and thoroughly distinctive. Dr. Dugès kindly sent a second lot from Guanajuato, Mexico, also taken from *Citellus macrourus*. This is its only known locality and host. The proportional lengths of hind tarsal joints are about 21–13–8–5–15, or nearly the same as in *irritans*.

PULEX BRASILIENSIS, new species.

Dr. Lutz sends a very distinct form occurring on *Mus rattus* and *Mus norvegicus* at Sao Paulo, Brazil.

The abdominal segments each bear but one transverse row of bristles; those on tergites, with about fourteen bristles each; those on sternites, with about eight each. On the inner side of hind coxa there are only six teeth in a short transverse row. The hind femora are provided laterally with a longitudinal row of about eight well-developed bristles. The proportional lengths of hind tarsal joints are about 28–18–9–5–11. Antepygidial spines, one on each side; prothorax, with about eight bristles near posterior border; mesothorax, with about twelve, and metathorax, with about fourteen.

Mandibles and labial palpi slender and nearly reaching end of anterior coxæ. Labial palpi apparently composed of 4 joints. Below the eye the gena is somewhat laminately extended over the antennal groove. Gena with two stout spines, one in front of upper extremity of eye, the other on lower edge over base of maxilla. Vertex with a row of five or six small bristles on either side along posterior margin, a stout one at lateral angle, a stout one at midway of antennal groove, and a small one above this last.

Style in female rather slender, tapering distally, and armed only with one long apical bristle. Substylar flap triangular, obtuse at apex, two or three bristles at apex, and four to six on upper margin. Caudal margin of eighth segment laterally with about eight to twelve large, stout spines, just before which are a similar number of smaller ones, and some distance behind which are two parallel rows of similar but fewer spines.

In the male the antepygidial bristles are elevated on well-developed tubercles. The upper claspers are small, slender, elliptical, and armed on outer surface with about six large spines as long as the whole organ, their bases close together and occupying about a third of the outer surface.

Length, female 5.5 mm.; male, 3.5 mm. Color, light brown.

Type.—Cat. No. 6895, U.S.N.M.

PULEX BOHLSII Wagner.

Dr. Wagner described this species from a single specimen sent him by Herr Poppe. It is an American species collected in Paraguay by Dr. Bohls, but the host is unknown. Wagner presents a drawing of the whole insect, excepting the legs, and gives a thorough description, so that it may be readily recognized when rediscovered. The vestiture is very dense for this section of the genus. The distinctive characters are given as far as possible in the synopsis. Wagner does not describe the armature on hind margin of antennal groove, so that this character was taken from his drawing. Neither does he figure the stylet of the female, although the individual illustrated was of this sex The proportional lengths of hind tarsal joints are about 29–19–10–5–10.

The median projection of the seventh abdominal tergite is a very noteworthy character, but slightly foreshadowed in *irritans*. It is very distinct in the drawing of *bohlsii*, in which, however, it does not reach beyond one-half the length of eighth tergite.

PULEX LUTZII, new species.

Nearly related to *P. bohlsii*, which it was at first taken to be. A detailed comparison proves it abundantly distinct according to the description and figure of *bohlsii* given by Wagner. Dr. Lutz found this species on *Grison vittata* at São Paulo in Brazil.

The following characters are noted in addition to those given in the synopsis.

On all the abdominal tergites there is a median dorsal spine, which is stouter than the others on these segments. The pro-, meso-, and metanotum have two transverse rows of bristles, those of the anterior rows much weaker, the number in each row about 14–16. The metathoracic scale has two rows of 4 spines each. Only the first and second abdominal tergites have the second row of smaller bristles,

the remainder having each but a single row of about 13 bristles. The sternites have single rows of 8–10 bristles each. The seventh tergite is medially produced caudad, so that it extends entirely over the eighth tergite. Antepygidial bristles, 1 on each side, mounted on distinct tubercles.

Labial palpi about equaling anterior coxæ and apparently six-jointed. In the maxillary palpi joint 3 is longer than 1, and 2 is longer than 4. Head with a very well-developed frontal notch, a very unusual character for this genus. Genæ with 2 oblique rows of bristles, the upper of 4 smaller, the lower of 3 much larger, in normal positions. Vertex with the usual row of bristles on hind margin, the lowest large and long, but the disc with two transverse rows parallel with hind margin, the first of about 12, the second of about 16 bristles. The armature of hind margin of antennal groove is very distinctive.

Hind coxæ without minute teeth on inner surface. The proportional lengths of hind tarsal joints are about 20–16–10–5–17.

The male has the lateral portion of the ninth tergite large and conical in outline and armed at the tip with three stout close-set spines. The upper claspers are long, slender, slightly enlarged toward the tip and there obliquely truncate backward where it is also armed with one longer, stouter, and several shorter weaker bristles.

Abdomen of female very bristly; posteriorly the bristles are stout and thick set, far more numerous than figured for *bohlsii*, the outlines of tenth tergite and hind margin of eighth being obscured by the numerous bristles. The style is almost perfectly cylindrical, rather stout and armed only with one stout spine at tip.

Length, male, 5.5 mm.; female, 6 mm.; color, very dark brown.

Type.—Cat. No. 6896, U.S.N.M.

PULEX ANOMALUS, new species.

*Plate X, figs. 1–6.

In 1899 I collected at Arboles, in southern Colorado, two specimens of a remarkable flea on a large gray-brown spermophile frequent in that region. It is in many respects congeneric with *irritans*, but it possesses a strong pronotal ctenidium of about nine spines.

The abdominal segments each possess but a single transverse row of bristles, eleven or twelve bristles in each row on the tergites, four or six in each on the abdominal sternites. The tergites are apparently without minute teeth. On the thorax the lateral spines are considerably the strongest. There are two antepygidial spines of medium size, one on each side.

The head is normal in the female, but in the male is flattened and thickened on top after the manner of *Ctenophyllus*. The frontal notch is completely absent. The gena possesses but two large heavy spines, one in front of the medium sized eye, the other near lower

margin over the maxilla. The vertex possesses the usual row (ten to twelve in this case) of bristles near hind margin, but they are gradually enlarged from above to the very large one at lower angle. Disc of vertex with two medium-sized spines back of middle of antennal grooves, one below and posterior to the other. Gena below eye not laminately projecting over antennal groove. Bristles on second joint of antennæ considerably exceeding third joint. In both sexes the antennal groove is connected by a chitinous thickening with the upper margin of the head. Hind margin of antennal groove with only two small bristles below. Mandibles reaching scarcely half of anterior coxæ. Maxillæ short, but long acuminate at apex.

Fore coxæ with comparatively few rather large spines. On inner side of hind coxa there is an oblique row of ten to twelve minute teeth. Hind femora with a row of six to eight bristles on the side. One of the apical spines on joint 2 of hind tarsi is longer than joints 3 and 4 together. The proportional lengths of hind tarsal joints are about 26–16–8–5–13. Eighth abdominal segment in both male and female laterally with two stout spines on each side. In the female the eighth tergite is clothed on hind margin laterally with numerous spines and bristles. The tenth tergite has two long apical spines and back of this several shorter. The style is very short and thick, somewhat narrowed apically, with one stout apical spine and two smaller spines back of apex beneath.

In the male the lateral portion of the ninth tergite is a large sclerite, rounded only above, with a stout tooth at posterior upper angle and numerous bristles along the upper margin. The upper claspers are of an elongate inverted plowshare shape, with the point dissected cephalad and with a few weak hairs on posterior border.

Length of male 1.5 mm., female 2.5 mm. Color, very dark reddish brown.

Type.—Cat. No. 6897, U.S.N.M.

PULEX AFFINIS, new species.

Prof. A. B. Cordley collected on a small *Lepus*, near the Grand Canyon in Arizona, two perfectly distinct species of fleas, one a *Pulex*, the other a *Ctenocephalus*, both represented by males and females. However, *glacialis* represents a general type like *avium*, *fasciatus*, etc., from which in late years many perfectly distinct forms have been separated. So it becomes necessary to give this the standing of a separate species. So very little is known of the fleas living on rabbits and hares in America, especially in northern North America, that nothing further can be said at present than that this is a relative of *glacialis*.

The pronotal ctenidium contains 16 to 18 spines. Abdominal segments, each with but one transverse row of bristles, about 14 in each

row on most of the tergites, 4 on most of the sternites. Antepygidial bristles two, and of medium size. Metathoracic epiphysis with two rows of six or seven bristles each. Thoracic segments with singles rows of about twelve bristles each, the bristles strongest laterally.

Head of female broadly rounded from occiput to mouth in female, flattened above somewhat in male. Gena without a lamina extending over antennal groove, but armed with two spines, one front of the middle of the large eye, the other on lower margin of head over maxilla. Vertex with the usual bristles and spine on hind border and two spines on disc back of antennal groove. Hind margin of antennal groove with a few minute hairs below. Mandibles extending to three-fourths length of anterior coxæ.

Fore coxæ normally clothed, fore femora with a number of scattering bristles on side, middle femora with scarcely any, hind femora with a lateral row of about six large bristles. Hind coxa with an oblique row of about ten rather stout but minute teeth on inside. The hind legs are large, unusually stout, and heavily spined. One of the apical spines on second joint reaches nearly to end of fifth joint. Proportional lengths of tarsal joints are about 25–16–9–5–16.

In the female the eighth abdominal segment has a lateral row of about five stout spines, the hind margin of this segment being plentifully clothed with long and short spines. Tenth tergite with a few long bristles. Style about twice as long as wide at base, narrowed to the apex, where there is a long, stout spine, and on the lower side are two slender bristles.

In the male the lateral portion of the ninth tergite is extended in a large, round lobe, about the apical border of which are placed six to eight large, stout spines. Upper claspers about twice longer than wide, somewhat narrowed to the apex, in which rests a short but very thick and stout black tooth. The lower claspers large triangular, extended fan-like, apical and lower margins bristly on upper portion of apical border, with a short, stout, deflexed spine.

Length, male, 2 mm.; female, 2.5 mm. Color, clear brown.

Type.—Cat. No. 6898, U.S.N.M.

PULEX LYNX, new species.

Plate X, figs. 7–11, and Plate XI, figs. 1–2.

Prof. J. M. Aldrich sends from Moscow, Idaho, a large series of a flea closely related to *affinis* but taken on lynx (*Lynx canadensis*).

In general, the vestiture and proportions are very close to those of *affinis*, but this species is more delicately constructed in both respects. The toothed upper male clasper is about four times as broad as long instead of only twice, and the lateral lobe of the ninth tergite is much narrower than in *affinis*. The lower claspers are not so sharply triangular and have far fewer bristles.

It seems something of an anomaly to find two species so closely related on such different hosts. If but one or a few specimens had been found on the lynx, I should have considered the occurrence accidental and surmised that these specimens were originally from some rabbit, but Professor Aldrich took a large series. Much more collecting will be necessary to throw any definite light on the matter.

Type.—Cat. No. 6899, U.S.N.M.

Genus CTENOCEPHALUS Kolenati.

1859. *Ctenocephalus* KOLENATI, Fauna V. Altvaters, p. 65.
1863. *Ctenocephalus* KOLENTI, Horæ Soc. Ent. Ross., II, p. 44.

The species grouped under this heading are essentially *Pulex* with etenidia on the genæ. The presence of the etenidium on the head may, perhaps, be an artificial character, but it is at least a definite one. That the grouping is an artificial one there is no question. The new *anomalus* must go into *Pulex*, but it is more closely related in many ways to *simplex* and *inæqualis*, also rabbit fleas. Every lot of new species alters one's ideas of the relationships. We know, as yet, but a lamentably small proportion of existing species. I would not care to attempt a recasting of these groups on such very fragmentary data, especially when this present arrangement can be well employed for the time being.

SYNOPSIS OF SPECIES.

a. Spines of head etenidia in longitudinal rows on lower margins of genæ; head not tuberculate in front.....*canis* (p. 384).
aa. Spines of head etenidia in oblique rows on hind margins of genæ; head tuberculate in front.
b. Mandibles reaching three-fourths of anterior coxæ; head etenidia in male with eight spines on each side.....*simplex* (p. 385).
bb. Mandibles slightly exceeding anterior coxæ; head etenidia in male with four or five spines on each side.....*inæqualis* (p. 385).

CTENOCEPHALUS CANIS Curtis.

The common cat and dog flea is probably the most widely distributed member of the order, occurring practically wherever cats and dogs occur. Dr. Lutz sends specimens from Brazil. It seems to be a normal and abundant parasite of cats and dogs, but has been found on a variety of other animals. It occurs commonly as a transient guest on almost all of the domesticated, semidomesticated, or caged animals, and will bite human beings whenever opportunity offers. Many reported cases of infestation of houses have been found to be due to this species, rather than to *Pulex irritans*. The case of a lot of fleas collected by Mr. Snyder from a fox at San Diego, California, offers a peculiar instance of unusual occurrence. A part of this lot proved to be *Pulex irritans* and the rest this species.

Taschenberg used the later name *serraticeps*, of Gervais, and I at first followed him in this as in other matters, though the ordinary rules of zoological nomenclature do not permit of its use.

I believed most heartily in Mr. Rothschild's much-needed segregation of the composite species *canis*, but his similar attempt in the case of *canis* and *felis* can not, it seems to me, possibly stand. He himself says that any constant distinctive character is lacking in the females. The difference in the males which he indicates would be very slight at best; they relate principally to the number and arrangement of the bristles on the discs of the male claspers. In America this is certainly widely variable. It can only be said that if his definition of these two species must be accepted, then a number more should be described from dogs and cats in this country, and, as in the first two, so the females of all would be practically indistinguishable.

CTENOCEPHALUS SIMPLEX Baker.

This form, originally described as a variety of *inæqualis*, is a distinct species. It occurs on *Lepus* in Michigan.

CTENOCEPHALUS INÆQUALIS Baker.

This was originally described from part of the material obtained by Prof. A. B. Cordly on *Lepus* near the Grand Canyon, in Arizona. Afterwards I collected the same thing on a *Lepus* at Arboles, Colorado, and Professor Aldrich sent me specimens from Moscow, Idaho.

Genus CERATOPHYLLUS Curtis.

1832. *Ceratophyllus* CURTIS, British Entomology, IX, No. 147.
1898. *Ceratophyllus* WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 557.

This is the largest genus in the order, containing many nearly related and very puzzling forms. Most of the species are very closely confined to their especial hosts, and none are cosmopolitan. *C. gallinæ*, or some of the European species affecting house rats or house mice, would be the most likely to become so. We have no record as yet of the occurrence of any of these in America, though it is almost impossible that they should not have been brought here. The fact is that no systematic attempt has been made to collect them. This is much to be regretted, and it is hoped that opportunity will soon offer to supply the necessary data.

In his very proper rehabilitation of this genus, Dr. Wagner uses the arrangement of the spines on the under side of the fifth tarsal joint as a distinctive character of special importance. It has been impossible for me to apply this to the many American species. As defined by him, these spines in *Ceratophyllus* are confined to 2 rows of 5 each on either margin, in *Ctenophthalmus* the first pair being

dislocated toward the median line and directed straight backward. Some of our species (*idahoensis*, *canadensis*, *petiolatus*, *arizonensis*, *braueri*, *arctomys*, *tuberculatus*, and *hirsutus*) are typical *Ceratophyllus* as defined by Wagner. Some were found which, like *proximus*, had the first pair of spines only slightly dislocated and bent inward, and it was puzzling indeed to find that *lucidus* and *charlottensis* were typical *Ctenophthalmus* on the fore legs, while the former was a genuine *Ceratophyllus* on the hind legs and the latter a *Pulex!* Then occurred the peculiar aberrant *perpinnatus* with a middle pair of the spines dislocated toward the center.

After all this I was prepared for the group of certainly Ceratophyllus species, which had the first pair of spines dislocated, as in *labiatus*, *keeni*, *pseudarctomys*, *californicus*, *ciliatus*, *wagneri*, *ignotus*, *divisus*, *coloradensis*, *oculatus*, *wickhami*, and *sexdentatus*, all of which are certainly to be regarded as more clearly congeneric with the type of *Ceratophyllus* rather than with that of *Ctenophthalmus*. For the time being there was but the one recourse of falling back upon the artificial (?) character of the presence or absence of a genal ctenidium, and so far as my studies have progressed it is the sole means by which I can separate these numerous species into two more or less homogeneous groups about the original types. The only alternative would seem to be the establishment of numerous genera, which will eventually have to be done, but which would seem to be unwise in the present very fragmentary condition of our knowledge of the existing species of the world.

All of the species of *Ceratophyllus*, so far as I have examined them, have on the inferior disk of the fifth tarsal joint numerous very minute hairs, and between the hind coxa and its epiphysis distally there is always formed a more or less deeply excavated emargination. In some other genera there are wide departures from these conditions though their uniformity has yet to be tested for all the species.

SYNOPSIS OF AMERICAN SPECIES.

a. Hind coxæ with one or more rows of minute teeth on inside distally.
  b. Eyes well developed; teeth on inside of hind coxæ in several rows.
    c. Pronotal ctenidium of 40 spines ..... *multispinosus* (p. 389).
    cc. Pronotal ctenidium of 24 spines ..... *dentatus* (p. 390).
  bb. Eyes rudimentary; teeth on inside of hind coxæ in one row; pronotal ctenidium of 14 spines ..... *charlottensis* (p. 390).
aa. Hind coxæ without minute teeth on inside.
  b. Fifth tarsal joint with the middle pair of lateral spines dislocated toward median line and replaced by two supernumerary spines; pronotal ctenidium of 36 spines ..... *perpinnatus* (p. 391).
  bb. Fifth tarsal joint never with middle pair of spines dislocated; pronotal ctenidium of 26 spines or less.
    c. Males without a strongly developed style projecting over pygidium; size medium to small; eyes usually present.

d. Hind tarsal joint I about equalling II and III together, rarely little more; never with a spine on apex of joint I of hind tarsi which exceeds joint II; head always with a distinct notch on the front.

c. Abdominal tergites with 3 distinctly marked rows of unusually numerous bristles; labial palpi nearly equalling anterior femora.

f. Frontal notch so reduced as to be almost absent; pronotal ctenidium of twenty-four spines ..... *alaskensis* (p. 394).

ff. Frontal notch very distinct; pronotal ctenidium of eighteen to twenty spines.

g. Frontal notch normal; antepygidial bristles, two on each side and of about equal length ..... *hirsutus* (p. 392).

gg. Frontal notch with the upper lip in the form of a strong tubercle; antepygidial bristles 3 on each side, the inner quite small, the middle largest ..... *tuberculatus* (p. 393)

cc. Abdominal tergites each with two normal transverse rows of bristles.

f. Hind tarsal joint II with apical spine scarcely exceeding joint III or shorter.

g. Lateral spines on last joint of hind tarsi with first pair distinctly dislocated toward median line, not merely bent inward, and always so on middle and fore tarsi.

h. Abdominal sternites with always more than two bristles on each side on at least five segments.

i. Hind femora with a longitudinal row on side of a number of bristles; pronotal ctenidium of eighteen spines.

j. First joint in middle tarsi distinctly longer than second or fifth; female style with a single very minute bristle on upper side ..... *californicus* (p. 395)

jj. First joint in middle tarsi about equal in length to second, and also to fifth.

k. Labial palpi scarcely equalling anterior coxæ. *oculatus* (p. 396).

kk. Labial palpi slightly exceeding anterior coxæ. *ciliatus* (p. 397).

ii. Hind femora without a longitudinal row of bristles on side, though one or two may occur there.

j. Pronotal ctenidium of twenty-four to twenty-six spines.

k. Upper clasper of male with one black tooth at upper and one at lower end ..... *pseudarctomys* (p. 399).

kk. Upper clasper of male with two black teeth at middle of hind margin ..... *keeni* (p. 400).

jj. Pronotal ctenidium of sixteen to eighteen spines; labial palpi equaling or shorter than anterior coxæ.

k. Fifth joint of middle tarsi much less than twice length of fourth, the second longer than fifth, and the first little longer than third ..... *leucopus* (p. 401).

kk. Fifth joint of middle tarsi always twice fourth in length or more, and other proportions different from above.

l. Labial palpi abnormally slender ..... *labiatus* (p. 402)

ll. Labial palpi normally stout.

m. Upper male claspers each with four black teeth *wickhami* (p. 403).

mm. Upper male claspers each with six black teeth. *sexdentatus* (403).

hh. Abdominal sternites with but two bristles on each side; upper claspers of male each with three stout black teeth on expanded middle portion of hind margin ..... *wagneri* (p. 405).

gg. Spines on last joint of hind tarsi in two rows on lateral margins, but with first pair slightly bent inward; labial palpi equaling or a little exceeding fore coxæ.

h. Disk of vertex back of antennal groove with six stout bristles. *asio* (p. 406).

hh. Disk of vertex back of antennal groove with but one to three stout bristles.

i. Pronotal ctenidium of twenty spines.

j. Joint III of hind tarsi with but two sets of spines on either margin ..... *canadensis* (p. 407).

jj. Joint III of hind tarsi with three sets of spines on either margin ..... *vison* (p. 408).

ii. Pronotal ctenidium of sixteen spines ..... *lucidus* (p. 410).

ff. Hind tarsal joint II with an apical spine exceeding joints III and IV together; hind femur with a row of minute bristles on side.

g. Eyes well developed; spines on fifth tarsal joint confined to two rows on lateral margins, though the first pair may be slightly bent inward.

h. Labial palpi nearly equaling anterior femora.

i. Gena below eye obtusely pointed posteriorily; length, female 2.75, male 1.75 ..... *montanus* (p. 411).

ii. Gena below eye subtruncate posteriorily; length, female 3.75, male 2.75 ..... *arctomys* (p. 411).

hh. Labial palpi equaling or a little exceeding anterior trochanters.

i. First pair of spines on last tarsal joint slightly bent inward ..... *proximus* (p. 412).

ii. First pair of spines on last tarsal joint curved outward, same as others.

j. Upper male claspers at upper extremity obliquely truncate toward body. The hind margin with one long and several short bristles ..... *bruneri* (p. 413).

jj. Upper male claspers obliquely truncate away from body or narrowed to a point above; hind margin with four long and several short bristles.

k. Genæ broadly truncate posteriorly below eye; upper male claspers distally gradually narrowed to a point. *idahoensis* (p. 413.)

kk. Genæ pointed posteriorly below eye; upper male claspers obliquely truncate away from body.

l. End of male abdomen with comparatively few long bristles ..... *arizonensis* (p. 415).

ll. End of male abdomen with a thick brush of long bristles on eighth segment ..... *petiolatus* (p. 415).

gg. Eyes rudimentary; first pair of spines on last tarsal joint dislocated toward median line.

h. Labal palpi not equaling anterior coxæ ..... *ignotus* (p. 416).

hh. Labal palpi exceeding anterior trochanters ..... *dirisus* (p. 416).

dd. Hind tarsal joint I equaling II, III, and V together.

e. A spine on apex of hind tarsal joint I much longer than joint II; front without the usual minute notch ..... *coloradensis* (p. 417).

ee. Spines on apex of hind tarsal joint I much shorter than II; front with the usual notch ..... *eremicus* (p. 417).

cc. Males with a stout style projecting from seventh tergite over at least one-third length of pygidium; size enormous; eyes absent ..... *stylosus* (p. 418).

CERATOPHYLLUS MULTISPINOSUS Baker.

Plate XII, figs. 1–5.

This flea, from *Lepus floridanus mallurus* at Raleigh, North Carolina, well illustrates some of my remarks under the genus. By all the characters which have been used to define the genus this species is a *Ceratophyllus*, yet I have no hesitation in saying that its strongest affinities are with the other rabbit fleas, *glacialis*, *affinis*, *inaequalis*, and *simplex*. The heavy posterior legs, the numerous minute teeth on inside of hind coxæ and the general habitus of the whole insect prove this unmistakably. But the last tarsal joint has five equal spines on either margin, and the prothorax only, possesses a ctenidium, which is unusually well developed. The original description is so incomplete that the species is here redescribed.

The single type specimen is a male, with head flattened above and thickened, and with a distinct frontal notch. The eye is large, rather low down, and not fully pigmented except around the margin. Gena with two oblique rows of spines, the upper of about six smaller, the lower of three much larger spines, the first of the latter being above and in front of the eye. Gena below eye posteriorly acute. First joint of antenna with numerous small bristles near the upper extremity, the second bearing about six heavy bristles, which are not as long as third joint. The antennal groove is connected with upper margin of head by a chitinous thickening. Hind margin of antennal groove sharply prominent below, where there are numerous small bristles on the margin; above this the margin is not clearly defined and the minute bristles are scattered. Hind margin of vertex, with the usual marginal row of about sixteen bristles, and there are two stout unequal spines at each lower angle. Just behind middle of antennal groove there are two small and one large spine. Mandibles about equaling fore coxæ. The pronotum has two rows of few weak bristles on disk, and on hind margin a row of about forty rather short and slender ctenidial spines, and a long stout spine at extreme lateral angle. The meso- and metanotum have a row of about 14–16 larger bristles behind and three or four rather irregular rows of numerous minute bristles on disk. Metathoracic scale with three spines near anterior border, an irregular row of six stouter ones across middle and one near hind margin. Abdominal tergites with one transverse row of about twenty-four large bristles and about two rows each of numerous minute bristles, though these latter are very irregularly placed. There are also two minute median black teeth on first seven tergites, and lateral teeth as follows: two on each side of first two segments, and one on each side of next five. On each side there are two antepygidial bristles, one of which exceeds tenth segment and is twice the length of the other. The tenth tergite is covered with a brushy mass of bristles,

and the lateral portions of the ninth with about a dozen stout bristles. Middle abdominal sternites each with a transverse row of six to eight bristles.

The hind tibiæ are stout and heavily bristled. Second joint of hind tarsi with one apical spine about equaling joint III. Hind femora with several bristles on lower margin proximally, three on lower margin distally, but only two minute bristles on side. Hind coxæ unusually heavily clothed with stiff bristles on outside anterior half; inside and below are several close-set irregular rows of numerous minute teeth.

Upper claspers nearly quadrangular, attached by one corner, the hind margin with a few weak hairs.

Length, 3.5 mm. Color, clear brown.

CERATOPHYLLUS DENTATUS, new species.

The single male specimen of this species in the collection was sent from Moscow, Idaho, by Prof. J. M. Aldrich, who found it on *Lynx canadensis*, associated with considerable numbers of another species. I regard this occurrence as purely accidental, and should not be surprised to learn eventually that its proper host was some species of *Lepus*, as its real affinities are with *multispinosus* and the other rabbit fleas.

This species is a very near relative of *multispinosus*, with distinguishing characters as follows: The pronotal ctenidium consists of about 26 close-set spines. The mandibles extend to about four-fifths the length of anterior coxæ. On each side of the vertex there are more than 3 spines. The black teeth on the abdominal tergites occur in pairs, one pair on each side near the dorsal line. The male claspers are twice longer than wide, narrowed on apical half below to a truncate apex; the margin with a number of scattering bristles and minute, weak hairs. One of the apical spines on joint II of hind tarsi is nearly as long as joints III and IV together. The minute teeth on inside of hind coxæ are even more numerous than in *multispinosus*.

Length, 3.5 mm. Color, rich brown.

Type.—Cat. No. 6900, U.S.N.M.

CERATOPHYLLUS CHARLOTTENSIS Baker.

Plate XII, figs. 6–10.

The Rev. J. H. Keen found this species in a mouse nest at Masset, Queen Charlotte Islands, and I described it as a Typhlopsylla on account of the reduced eyes. It possesses several remarkable characters not mentioned in the meager original description. It has the typical form of body of a Ceratophyllus. The spines of last tarsal joint on fore and middle legs are arranged as in *Ctenophthalmus*, those

on hindlegs as in *Pulex*. One of the most suggestive characters is the reduced group of teeth on inside of hind coxæ, composed of about eight teeth in one nearly even row. It is the only species of the true Ceratophyllus form in which I have seen these teeth. It should be noted that the second and third abdominal tergites possess four minute teeth each, and the fourth and fifth two each. There are three antepygidial spines on each side, one long one between two shorter.

The end of the female abdomen possesses comparatively few bristles. The style is twice longer than wide at base, gradually narrowed to the tip, where there is a long spine just before which on the upper margin is a minute bristle. The substylar flap has a few longer bristles at end and a few shorter on lower margin. Laterally the eighth tergite bears three long spines and a few bristles. Length, 2.5 mm. Color, pale brown. Only females are known.

CERATOPHYLLUS PERPINNATUS, new species.

Plate XIII, figs. 1–6.

From the Queen Charlotte Islands the Rev. J. H. Keen also sends a flea of remarkable aspect, but of which he does not give the host. It possesses one especially salient character not recorded for any other species of the order. The last tarsal joint has the middle pair of spines dislocated toward the median line, but these are replaced toward the outside by a supernumerary pair, making six pairs of the ordinary spines on the underside of the last tarsal joint on all the legs.

The single specimen is a male. The head is rather rounded and bulging in front, with a sharply defined frontal notch, though flattened and thickened on top after the usual manner. The eye is large and nearly circular. The gena is provided with three oblique rows of bristles, the upper row of about 8 small, short bristles, the second with four larger, and the lower with three long and stout bristles. The antennal groove extends nearly to the upper margin of the head, with which it is connected by a chitinous thickening. The bristles on second antennal joint are small and few, and much shorter than third joint. The hind margin of antennal groove is lined with minute scattering hairs. On the hind margin of the head occurs the usual row of about 14 bristles, those at the lower angles large and long. The disk of the vertex has two oblique rows of bristles on either side near the upper margin of the head, the upper row with about 4, the lower with about 6 bristles, all becoming smaller backward. The mandibles extend to a little more than two-thirds of anterior coxæ. The first joint of the maxillary palpi is somewhat longer than the second.

The pronotum is armed with a transverse row of about 12 small bristles on the disk and on the hind margin a ctenidium of about 36 rather slender and close-set spines. The mesonotum and metanotum have each a transverse row of about 12 bristles and cephalad of this

on each, several rows of somewhat scattered minute hairs. The metathoracic epiphysis has two rows of rather large bristles, about 3 in each row.

The abdominal tergites each have a transverse row of 14 to 16 larger bristles and a second row of much smaller ones. There is one antepygidial bristle on each side, and these do not equal the tenth tergite. Most of the middle abdominal sternites have each a single transverse row of 6 bristles.

The genitalia are of the general *Ceratophyllus* type and yet are quite unique in detail. The lateral portion of the ninth tergite is lobed above, the lobe as long as wide at base, tip obliquely rounded and provided with a bristle. The rounded portion beneath which the upper clasper is attached is provided, as is frequently the case, with two long bristles. The upper claspers are subquadrangular, attached by the lower inner angle, the upper inner angle somewhat produced and provided with three minute hairs, the upper angle broadly rounded, the lower angle considerably swollen and produced and provided with a large long tooth which is distorted near its tip; the hind margin is provided with a bristle at top, below this two short spines, and with two more short spines above the lower tooth.

Hind coxæ without minute teeth on inside. Hind femur with but one minute hair on the side. Spines on apex of second joint of hind tarsi all shorter than the third joint. Hind tarsal joints with lengths in following proportions: 20–15–9–5–10.

Length, 3 mm. Color, light brown.

Type.—Cat. No. 6901, U.S.N.M.

CERATOPHYLLUS HIRSUTUS Baker.

Plate XVII, figs. 1–4.

The prairie-dog flea, not uncommon in Colorado at least, is a very conspicuous species by reason of the great length of the labial palpi and inclosed organs, and the very heavy bristling of the abdomen, though the bristling of other parts is normal. Only females are represented in the collection.

The upper margin of the head slopes very strongly from base to mouth, the distinct frontal notch being very low down. The eye is very small in proportion to size of head. Just above the eye are a few minute hairs. The gena bears three heavy bristles below, the inner above and slightly in front of eye, the outer on lower margin; above these are two bristles, one larger on lower margin and one small one in center of gena. The gena below the eye is subtruncate posteriorly. The antennal groove is unusually broad for its length, extending to two-thirds the height of the head; the hind margin is provided with numerous small hairs. The numerous bristles on second antennal joint considerably exceed third joint. The usual bristles

occur on hind margin of head, though but a single rather stout bristle occurs on disk of vertex back of antennal groove. The labial palpi nearly equal the anterior femora. The maxillæ are unusually slender.

The prothoracic ctenidium contains about tweny spines. The metanotum and first three abdominal tergites have four minute but stout dark-colored teeth on hind margins. The abdominal tergites are provided with very numerous bristles in several rows, the principal rows with about 20 to 24 bristles each. Antepygidial spines, two on each side and of about equal length. Abdominal sternites third to sixth inclusive, each with a row of about 12 larger bristles and several smaller back of these; the seventh and eighth sternites with numerous bristles in several somewhat scattered rows. Style rather stout, with one long bristle at tip and with others nearly as heavy along the sides. Substylar flap nearly hidden in bristles.

The hind coxa without minute teeth inside. Hind femur with a straight row of about ten minute bristles on side. There are 2 apical spines on joint II of hind tarsi, which nearly equal joints iii and iv together. The spines on the last tarsal joints occur in the typical Ceratophyllus order. Lengths of hind tarsal joints in the proportions of 21–12.5–8.5–5–9.

Length, 2–3 mm. Color, light brown.

CERATOPHYLLUS TUBERCULATUS, new species.

Plate XIII, figs. 7–9.

Professor Aldrich has collected from *Citellus columbianus* at Moscow, Idaho, a species which is closely related to *hirsutus*, but which, however, shows striking specific differences. There are but two specimens—fortunately male and female.

Female: The head has the same strongly sloping upper margin as in *hirsutus*, but the upper lip of the frontal notch projects as a conspicuous tubercle. The gena bears the usual three heavy bristles below, with a small one between the first two, but the upper row is represented by only one, and that on the lower margin. Just above the eye are a number of minute hairs. This species also has the hind margin of the antennal groove provided with a number of minute bristles, and one large bristle occurs on disk of vertex behind middle of antennal groove. The gena below eye is acute posteriorly. The dozen close-set bristles on second joint of antenna are longer than third joint. The labial palpi extend to about three-fourths of anterior femora.

Thoracic nota with two transverse rows of bristles, the principal with about 10 good-sized bristles. The prothoracic ctenidium contains about 18 spines. The abdominal terga have about 16 to 18 large bristles in the principal row, and with numerous minute bristles in two more or less well-defined rows back of these. The minute hairs

which in most *Ceratophyllus* species occur in the same row between the larger bristles are here of very unusual size, being nearly half the size of the large bristles. In most other species they are quite inconspicuous.

There are three antepygidial bristles on each side, two quite unequal large ones and a small one behind and near the median line. The abdominal sternites are here more heavily clothed than in any species of the genus known to me, and the number of bristles increases caudad. There are two or three rows to each sternite, the principal row on the third segment numbering 18 and on the seventh 20. On the eighth sternite the bristles are rather short and scattering.

The style is rather stout with one long apical bristle and several smaller along the sides. The substylar flap has several long bristles at tip and a mass of short stout bristles on lower margin.

The hind coxæ lack minute teeth on inside. The hind femur has a row of about six bristles on the side. One of the apical spines on joint II of hind tarsus exceeds joints III and IV together. The spines on fifth tarsal joint occur in the typical *Ceratophyllus* order. Lengths of hind tarsal joints in the proportions of 20–16.5–7.5–5–10.

Length, 2.3 mm.

Male: The male before me is a most extraordinary looking creature, due to a malformation. The upper margin of head is evidently normally flattened in this species as usual in *Ceratophyllus*, but in this specimen is collapsed inward and deeply concave. The upper row of genal bristles is composed of three members. As in most males, the third antennal joint is somewhat extended so that the bristles on second joint are not as long as the third. The genitalia are entirely inclosed from view in this specimen, within the much extended and posteriorly truncated eighth segment which has on its surface a number of long, stout, rather distant bristles. The lateral portion of the ninth tergite is not lobed above, but is broadly rounded. The upper claspers are long, slightly curved sickle fashion, acute at tip, and armed on posterior border with about seven bristles.

Length, 2 mm. Color, rather darker brown dorsally.

Type.—Cat. No. 6902, U.S.N.M.

CERATOPHYLLUS ALASKENSIS, new species.

Dr. Kellogg presented me with some specimens of a species taken by Mr. McElhaney on *Citellus barrowensis* at Point Barrow, Alaska. This is the farthest north record for the order in America. This species is also the largest one known to occur on any spermophile.

Female: Head broadly evenly rounded from occiput to mouth, the frontal notch almost wanting. Gena with the usual three heavy bristles below, the upper row represented by one on the margin. The eye is small compared with size of head, and low down. Gena below eye

posteriorly truncate. Antennal groove reaching two-thirds the depth of the head, the hind margin with a number of scattering minute bristles. The hind margin of the head is provided with the usual bristles, the disk of the vertex with one heavy bristle behind middle of antennal groove. Second joint of antenna with about a dozen bristles which extend beyond third joint. Labial palpi extending to more than half of anterior femora.

Thoracic nota each with one row of 10 to 12 large bristles and one of smaller. The pronotal ctenidium contains 24 slender spines.

Abdominal tergites with three distinct rows of bristles, the principal row of 16 to 18 bristles, the minute hairs between these last very inconspicuous. Antepygidial spines three on each side, two larger unequal and one smaller near the median line. Abdominal sternites with three rows of bristles each, the far greater number occurring in the principal row, which has 18 to 20 bristles. The eighth tergite laterally bears numerous rather distant short bristles. Just beneath the pygidium on either side occur five strong bristles.

The style is very thick and swollen, with two long stout bristles on the apex, and four or five just before the apex. The substylar flap has several long bristles at tip and a number of short, stout ones on lower margin.

Hind coxæ without minute teeth inside. Hind femora with a row of about 10 minute bristles on the side. One of the apical spines on the second hind tarsal joint equals in length joint III and half of IV together. Spines on last tarsal joint of the typical *Ceratophyllus* type. Lengths of hind tarsal joints in the proportion 20–13–9–5–10. Length 4 mm.

Male: Head flattened on top as usual. Pronotal ctenidium of 22 spines. Eighth abdominal tergite with a number of heavy bristles on the upper posterior portion, in three rows of 4 each, and with the hind margin incurved. Lateral portion of the ninth tergite with a broad rounded upper lobe, with two widely separated long bristles over the attachment of claspers. Upper claspers more than twice longer than wide, somewhat sickle-shaped, but broad and obtuse at tip, the hind margin with a few weak bristles.

Length, 3.25 mm. Color, rich brown, darker dorsally.

Type.—Cat. No. 6903, U.S.N.M.

CERATOPHYLLUS CALIFORNICUS, new species.

Plate XVII, figs. 5–8.

There is in the collection one female specimen of a flea collected at Mountain View, California, on a field mouse, by Mr. Edward Ehrhorn, which differs from any other mouse flea yet described.

Head evenly rounded from occiput to mouth, the frontal notch rather low and inconspicuous. Gena with three stout bristles below, the upper row represented by two bristles, one smaller than the other,

above the eye. Eyes nearly round and of medium size. Gena below eye obtusely pointed posteriorly. Hind margin of antennal groove sharply prominent and with a number of minute hairs. Antennal groove extending to two-thirds the depth of the head. Bristles on second antennal joint not extending beyond third joint. Behind the middle of the antennal groove on the disk of the vertex there is one stout bristle. The usual bristles occur on hind margin of head. The labial palpi exceed slightly the anterior trochanters. Pronotum with a transverse row of about fourteen bristles on disk, and on hind margin a ctenidium of eighteen or twenty stout spines. Mesonotum and metanotum each with two rows of bristles, those in posterior row larger and fourteen in number, the anterior row with numerous smaller ones. Hind margin of metanotum with two small teeth on each side. First three abdominal tergites with one small tooth on each side. Abdominal tergites each with two rows of bristles, the posterior with about fourteen larger, the anterior with fewer smaller bristles. Antepygidial bristles three on each side, the inner smallest, the middle longest. Abdominal sternites each with a row of eight or ten rather stout bristles. Two stout bristles occur on each side just beneath the pygidium. Lateral portion of eighth tergite with three or four stout bristles on the hind margin.

Female style rather stout, narrowed to a point, where there is a long bristle; there is also a bristle on the lower margin, and one very minute one above. The substylar flap is pointed, possesses several long, slender bristles at apex, and a number of short, stout bristles on lower margin.

Hind coxæ without minute teeth on inside. Hind femur with a row of four to five small bristles on the side. Spines on the apex of second joint of hind tarsus shorter than third joint. First pair of spines on last joint of hind tarsus somewhat dislocated toward median line. Lengths of joints of hind tarsi in the proportion 21.5–13.5–8–5–9.

Length, 2.5 mm. Color, pale brown.

Type.—Cat. No. 6904, U.S.N.M.

CERATOPHYLLUS OCULATUS, new species.

Plate XIX, figs. 10–14.

This species is based on a single male specimen collected on mink in Washington, District of Columbia, by Mr. A. A. Harsall.

The head is flattened above as usual, the frontal notch very distinct and rather high. The lower row of genal bristles contains two large bristles with one small one between them. The superior row is represented by four or five bristles extending very obliquely from above the uppermost bristle on the upper margin of the eye to the upper fourth of the antennal groove. The antennal groove extends to the upper margin of the head, and is suddenly broadened in the

lower fourth. On the middle of hind margin of antennal groove occur a few minute hairs, while just back of the margin on disk of vertex stands one stout bristle. The usual bristles occur on hind margin of head, with a large long one at lower angle on either side. Labial palpi about equaling anterior coxae. The fourth joint of maxillary palpi is unusually slender.

Pronotum with a transverse row of twelve bristles and on hind margin a ctenidium of eighteen stout spines. Hind margin of metanotum with two small teeth on each side, first and second abdominal tergites the same, the third with only one on each side. Abdominal tergites with two rows of bristles each, the larger bristles, eighteen in number on each of the middle segments. Middle abdominal sternites with three or four bristles on each side. Antepygidial bristles three on each side, the middle one of each group very large, the other two small, though not reduced to hairs. Hind margin of lateral portions of eighth segment with about six stout bristles. Lateral portion of ninth tergite with a short, thick lobe, which is obliquely truncate and bears a hair at tip. The upper clasper is short and thick, almost crescentiform, with the hind margin rounded and the upper end acutely angled, but the base is broad; on the upper portion of the hind margin there are two bristles and two or three hairs.

Hind coxa without minute teeth inside. Hind femur with a row of four or five distant bristles on the side. Apical spines on second joint of hind tarsi shorter than third joint; first pair of spines on last joint distinctly dislocated toward median line. Length of middle tarsal joints in the proportion 12–12–9–5–12.

Length, 2.5 mm. Color, pale brown; middle of dorsum darker.

Type.—Cat. No. 6905, U.S.N.M.

CERATOPHYLLUS CILIATUS, new species.

Plate XVI, figs. 1–6.

Mr. Ehrhorn also contributes from Mountain View, California, the male and female of a species occurring on a chipmunk. It is closely related to *californicus*. Unfortunately the male of the latter is unknown, but the females differ in many characters.

Female: Head rather strongly rounded from occiput to mouth, the minute frontal notch rather low down. Lower row of genal bristles of three subequal bristles, the upper row of four or five much smaller. Eyes ovate and low down in head. Antennal groove rather small and reaching two-thirds the depth of the head. Bristles on second antennal joint much shorter than third joint. Hind margin of antennal groove with a few minute hairs, especially near the lower angle. Caudad of the middle of the antennal groove, on the disc of the vertex, are three bristles, two small and one large one, the latter situated almost on the margin of the groove. Hind margin of the head with the usual bris-

tles, the large one at lower angle somewhat raised and with a smaller one below it. Labial palpi considerably exceeding anterior trochanters.

Pronotum with one transverse row of about fourteen bristles on the disc, the one at each lateral angle large and long; hind margin with a ctenidium of eighteen stout spines. Meso- and metanotum each with three rows of bristles, the posterior row of twelve to fourteen larger bristles, those of the second more numerous but smaller, and the third of fewer and still smaller ones. Hind margin of metanotum with a small tooth on each side, first tergite with two, second with two, and third with one, on each side. Abdominal tergites each with twelve to fourteen large bristles in one row, and a less number of smaller bristles in the second row. Antepygidial bristles three on each side, the middle one in each group largest. Abdominal sternites each with two rows of bristles, the posterior of eight to ten larger, and the anterior with eight to twelve smaller, rather scattered ones. Beneath the pygidium on either side there is a group of five stout bristles. The style is rather short and thick, with one long bristle at apex, one on lower margin, and two on upper margin. The substylar flap is apically unusually broad, with the usual long bristles at extreme tip, the lower margin with a group of short, slender, dark-colored spines.

Hind coxæ without minute teeth on inside. Hind femur with a longitudinal row of four to five bristles on the side. None of the apical spines on second joint of hind tarsi exceed joint III. First pair of spines on last tarsal joint dislocated toward median line, though not so distinctly so on hind tarsi. Lengths of joints of hind tarsi in the proportion 23–15–9–5–10.

Length, 2.5 mm. Color, clear brown, darker dorsally.

Male: Head flattened above as usual, the frontal notch much higher on the front than in the female. Antennal groove reaching upper margin of head. Antepygidial bristles three on each side, but the outer two in each set aborted. Eighth tergite with two rows of four to five stout bristles on each side near hind margin.

Lateral portion of ninth tergite with a stout thumb-shaped lobe, and the two usual bristles over insertion of upper claspers. The upper claspers are long and slender, the upper end suddenly expanded, this latter portion being acute angled in front and rounded behind, with two short, blunt, dark-colored teeth; near base on hind margin is a stout straight bristle. The slender ventral style has a long and a short bristle at apex, which stand out nearly at right angles.

Length, 2.3 mm.

Type.—Cat. No. 6906, U.S.N.M.

CERATOPHYLLUS PSEUDARCTOMYS, new species.

Plate XXIV, figs. 1–7.

Two females and a male taken from *Arctomys monax* at Newport, Herkimer County, New York, were sent to me by Mr. D. B. Young. This species is one of the most unique forms in the American fauna, presenting several characters not before noted in the Siphonaptera.

Female: Head very broadly rounded from occiput to mouth. Three bristles in the lower row on gena, the middle bristle smaller, and between this and the outside ones a number of minute hairs in the same row. Upper genal row entirely lacking, although a number of minute hairs occur above the eye. Eye subelliptical, low in the head and rather small in proportion. Antennal groove not reaching two-thirds the depth of the head, the hind margin sharply marked and with a number of minute hairs scattered along it. Second antennal joint with four or five bristles which do not extend beyond the third joint. In the position of the stout bristle usually found back of the middle of the antennal groove there is here only a minute hair. Hind margin of head with the usual bristles, except that at each lower angle there are two stout bristles, the lower shorter than the upper. Labial palpi reaching to about half the length of anterior trochanters. Maxillæ unusually blunt.

Pronotum with a row of about fourteen bristles near the hind margin, which is provided with a ctenidium of about twenty-six close-set spines. Meso- and metanotum each with two rows of bristles, the posterior of about twelve larger ones, the anterior of about the same number of much smaller bristles. Metathoracic epiphysis with two longer and three shorter spines.

First and second abdominal tergites with three small teeth on each side, the third and fourth with two on each side. Abdominal tergites each with two rows of bristles, the posterior of fourteen to sixteen larger bristles, the anterior of fewer smaller ones. Antepygidial bristles three on each side and long and stout, the middle one in each group largest. Most of the abdominal tergites each with about five unusually stout bristles in one row, and with a second row of one to three smaller bristles. Immediately beneath pygidium on either side are two long and two shorter bristles. Lower posterior angle of lateral portion of eighth tergite with four stout bristles and cephalad of these two others. End of abdomen with comparatively light vestiture.

The style is long, becoming slender and slightly curved upward, with a long bristle at apex and one on lower margin. Substylar flap slender and with very large bristles at apex and several short, stout ones on lower margin.

Hind coxæ without minute teeth inside. Hind femur with but a single minute hair on inside. Apical spines on second joint of hind tarsi nor extending beyond third joint. First pair of spines on fifth joint of hind tarsi strongly dislocated toward the median line. Lengths of joints of hind tarsi in the proportion 25.5–15–8–5–9.

Length, 3.5 mm. Color, clear brown.

Male: Head flattened on top after the usual manner. Along the front margin of antennal groove, above the eye, are three or four small bristles. There are a far greater number of minute hairs on hind margin of antennal groove than in the female.

On the meso- and metanotum and first abdominal segment occurs an arrangement of bristles which is entirely unique in the whole order.

On the side of meso- and metanotum is a tongue-shaped area, pointed backward, and common to the two sclerites. About the margin of this are the bristles arranged—especially long and numerous on the upper margin. On the first abdominal segment is a similarly outlined area extending backward from metanotum, though much smaller and with but seven or eight bristles about its margin. Antepygidial bristles three on each side, the outer two in each set well developed, the inner aborted.

The genitalia are very strongly and uniquely developed. The posterior portion of the abdomen is characterized by numerous long, stout bristles, gathered into two brush-like lots below, while above, the hind margin of eighth segment laterally has a row of about twelve of these long bristles, just behind which are a greater number of small ones. The lateral portion of ninth tergite has the usual dorsal lobe, which is here long and slender; the portion bearing the two bristles just over insertion of upper claspers is here narrowly produced beyond the hind margin of the claspers—a very unique arrangement. The upper claspers are long and slender, the upper and lower posterior angles strongly roundly produced, and each armed with a stout dark tooth, the upper one long and bent, the lower short, straight, and accompanied by a short bristle which stands just above it.

Length, 2.75 mm.

Type.—Cat. No. 6907, U.S.N.M.

CERATOPHYLLUS KEENI Baker.

Plate XVI, figs. 7–12.

This species was described from specimens taken on *Peromyscus keeni* at Masset, Queen Charlotte Islands, by Rev. J. H. Keen. All of our records for the Queen Charlotte Islands are due to this gentleman, and his contributions have been most important ones. Additions and corrections to the original description will be evident in the figures and synopsis.

CERATOPHYLLUS LEUCOPUS, new species.

There is a single female in the collection, taken on *Peromyscus leucopus* at Peterboro, New York, by Gerrit S. Miller, jr., which differs widely from the species found on *Peromyscus* in the Southwest.

Head strongly rounded in from front to mouth, the frontal notch distinct and accompanied by a small chitinous fold. Gena with two oblique rows of bristles; of the lower three large bristles the middle is smallest; the upper row contains about six small bristles of varying sizes. A few small hairs occur just above the eye. Gena below the eye very obtusely angled posteriorly. The antennal groove extends to two-thirds the depth of the head; along its hind margin are scattered a number of small hairs, largest at the lower angle. The second antennal joint is provided with a few bristles which are shorter than the third joint. Disk of vertex back of middle of antennal groove provided with one large and two small bristles. Hind margin of head with the usual bristles, except that at the lower angle there are two stout bristles, the lower of which is the smaller. The labial palpi reach to about three-fourths the length of anterior coxæ.

Pronotum with a transverse row of about twelve bristles on posterior third and on hind margin a ctenidium of eighteen long, stout spines. Meso and metanotum each with two rows of bristles, the posterior with about ten long ones, the anterior of more numerous small ones. Metathoracic epiphysis with two large bristles behind, in front of these four smaller ones, and still in front of these one bristle. Metanotum and first four abdominal tergites each with a small tooth on either side.

Middle abdominal tergites with two rows of bristles, twelve to fourteen larger bristles each on the posterior, fewer and smaller ones on the anterior segments. Antepygidial spines three on each side, the middle one in each group largest, the inner smallest. The middle abdominal sternites each with a single row of about eight large bristles.

Vestiture of end of abdomen not heavy. Beneath the pygidium on either side are two long bristles. Style long and slender, gradually narrowed to the tip, where there is one long bristle; on the lower margin also stands a bristle. Substylar flap obtuse, with two long slender bristles at extremity, the lower margin armed with four or five short, stout bristles.

Hind coxæ lacking minute teeth inside. Hind femur with one or two small bristles on the side, proximally. Spines on apex of second joint of hind tarsi all shorter than the third joint. First pair of spines on last joint of hind tarsi strongly dislocated toward the median line and pointing straight distad. Lengths of joints of hind tarsi in the proportions 21–12–7.5–5–8.

Length, 2 mm. Color, pale brown.

Type.—Cat. No. 6908, U.S.N.M.

CERATOPHYLLUS LABIATUS, new species.

Plate XIX, figs. 6–9.

Of several species which Professor Aldrich found on *Lynx canadensis* at Moscow, Idaho, this is the most puzzling. It is represented by only one female. Probably its normal host is not *Lynx*, but some one of the small rodents inhabiting that region.

Head rounded, with an unusually even, rather strong, curve from occiput to mouth. Frontal notch minute. Gena with the usual lower row of three stout bristles, the middle bristle smaller. The second row is represented by a single small bristle above upper bristle of lower row. A few small hairs occur above the rather elliptical eye. Gena below eye truncated posteriorly. Antennal groove extending to two-thirds the depth of the head, with a few hairs scattered along its hind margin, these hairs being longer below. The second joint of antennæ has about five bristles which extend beyond the apex of the third. On the disk of the vertex behind the middle of the antennal groove occurs one large, stout spine and two far smaller ones. Hind margin of head with the usual bristles, but at each inferior angle there are two, the lower of which is smaller. The labial palpi are very slender and about equal anterior coxæ.

Pronotum with two rows of bristles—about twelve on the posterior third, about eight on the anterior third, and on the hind margin a ctenidium of about eighteen spines. Meso- and metanotum with two rows of bristles each, the posterior row having about ten bristles. Metanotum and first three abdominal tergites each with a small tooth on either side of hind margin. Metathoracic epiphysis with four bristles, two large and two small. Abdominal tergites each with two rows of bristles, the posterior of about fourteen larger ones, the anterior of fewer and smaller bristles. Middle abdominal sternites each with a row of eight long, strong bristles. The last few sternites are provided with second rows of smaller bristles. The antepygidial bristles are very strong and three in number on either side, the longer middle one in each group extending beyond the pygidium.

Beneath the pygidium on either side stand three bristles in a perpendicular row. The vestiture of the end of the abdomen is rather heavy. Style somewhat more than twice longer than wide at base and narrowing to a point where there is a long apical bristle. Back of apex below is inserted another smaller bristle. The substylar flap is obtuse, with two long bristles near the apex and four or five short, stout ones on the lower margin. The lower lateral portion of the eighth segment bears a number of normal bristles and also about seven short, stout, dark-colored bristles which are almost spines, in this latter respect differing widely from any nearly related species.

Hind coxæ without minute teeth inside. Hind femora with one minute bristle on the side, and the lower thin margin, which usually occurs only near apex, is in this case extended to the base. Apical spines on second joint of hind tarsi all shorter than third joint. First pair of spines on the fifth tarsal joint strongly dislocated toward middle and turned straight distad. Length of hind tarsal joints in the proportion 19–13–8–5–7.

Length, 2.6 mm. Color, clear brown.

Type.—Cat. No. 6909, U.S.N.M.

CERATOPHYLLUS WICKHAMI Baker.

Plate XXVI, figs. 1–7.

Later studies have convinced me that the three squirrel fleas which were described by me in the "Preliminary Studies" are one and the same. They were separated on characters, the value of which, at that early stage in the work and without precedent to follow, was impossible to correctly estimate. The above name, having priority over the others, is the one to be used. This name was originally applied to specimens taken from *Sciuropterus volans* at Iowa City, Iowa, by Mr. H. F. Wickham. There are now in the collection specimens from fox squirrel taken in Indian Territory (W. W. Cooke); from gray squirrel taken in Santa Cruz County, California (Edward Ehrhorn); from *Progne subis* at Wellesley, Massachusetts (A. P. Morse—and this occurrence unquestionably accidental); from *Peromyscus* at Franconia, New Hampshire (Mrs. A. T. Slosson), and from *Arctomys monax* at Newport, Herkimer County, New York (D. B. Young).

A very conspicuous and constant character is found in the armature of the upper claspers of the male. The four black teeth occurring there are thoroughly diagnostic. Other details not given in the original description may be had from the synopsis and figures.

CERATOPHYLLUS SEXDENTATUS, new species.

Plate XXVI, figs. 8–14.

A species very close to *wickhami*, and yet conspicuously distinct, is sent from Boulder Creek, California, where it was taken from *Neotoma* by Mr. Edward Ehrhorn. Mr. Ehrhorn tells me of finding with this a species of great size, but I have not seen it.

Female: Upper margin of head rapidly sloping forward from occiput, but rather strongly rounded in front. Frontal notch very inconspicuous. Lower row of genal bristles consisting of three, the middle smaller; the upper row of three or four small bristles is very oblique and not extended farther cephalad than above middle bristle of lower row. Several minute hairs occur above the rather small ovate eye. Antennal groove extending to two-thirds the depth of the head, the

prominent hind margin with a very few minute hairs. The second antennal joint with about seven bristles, which extend beyond the third joint. Behind the middle of antennal groove there are two small bristles—the usual large, stout bristle absent. Hind margin of head with the usual bristles, except that at lower angles there are two stouter ones, the lower smaller. Labial palpi nearly equaling the anterior coxæ.

Pronotum with a transverse row of ten or twelve bristles on the posterior third, the hind margin with a ctenidium of about twenty stout spines. The posterior row of bristles on meso and metanotum of ten rather long ones, the anterior row of more numerous and smaller ones. Hind margin of metanotum and first, second, and third abdominal tergites with a small tooth on either side. Metathoracic epiphysis with two large bristles near the hind margin, two smaller anterior to these, and two still smaller in front of these last. Middle tergites of abdomen each with twelve or fourteen larger bristles in the posterior row, fewer smaller ones in the anterior row. Antepygidia bristles three on each side, the middle one of each group largest, and reaching over pygidium, the inner smallest. Middle abdominal sternites each with a row of about eight stout bristles; posteriorly the sternites have a second row of few bristles. Beneath the pygidium laterally occur three large bristles. Hind margin of eighth segment laterally with about six strong bristles around the lower angle.

The style is about two times as long as wide at base, gradually narrowed to the tip, where there is a long bristle; another bristle occurs on lower margin just back of tip. Substylar flap obtuse at tip, near which are two long bristles, the lower margin with four or five short, stout bristles.

Hind coxæ without minute teeth inside. Hind femora with but one minute bristle on side. Apical bristles on second joint of hind tarsi shorter than third joint. First pair of spines on last tarsal joint strongly dislocated toward median line and directed straight distad. Lengths of hind tarsal joints in the following proportions: 21.5–12–8.5–5–8.

Length, 2.75 mm. Color, clear brown.

Male: Head flattened above as usual. Front strongly rounded above. Antennal groove reaching the top of the head. Upper row of bristles on genæ with about six small ones; the upper three or four on margin of antennal groove. Hind margin of head with but one large bristle at lower angle. Antepygidial bristles, two on each side, the normal inner one being reduced to a hair; the inner bristle in each group is very long, extending over pygidium, the outer about half as long. Hind margin of eighth segment laterally with but two strong bristles and a few small ones.

Lateral portion of ninth tergite with the lobe large and thumb-shaped, nearly equaling the claspers, and scarcely dilated where stand the usual two bristles over insertion of claspers. The upper clasper is a large, subtriangular stalked sclerite with the inner edge vertica and the angles rounded. The sloping hind margin is armed with six short, stout, black teeth, five below on the dilated portion and one above, where there are also three bristles on the margin. The lower claspers also each bear a single, stout, black, deflected tooth.

Length, 2.25 mm.

Type.—Cat. No. 6910, U.S.N.M.

CERATOPHYLLUS WAGNERI, new species.

Plate XV, figs. 3–7.

Two specimens of this unusually distinct species were collected by Professor Aldrich at Moscow, Idaho. Both were males, one coming from the white-footed mouse (*Peromyscus leucopus*), and one from the house mouse. This last is one of very few records for fleas on house mice or rats in America. But it is entirely different from any European species occurring on this animal.

The head is flattened above in the usual manner. The front is very roundly curved to the mouth, the frontal notch very distinct and rather high on the front. Gena with two oblique rows of bristles, the lower row of three, with the two outer quite heavy, the upper row of five or six considerably smaller. Gena below eye narrowed posteriorly to an obtuse point. The rather narrow antennal groove, reaching nearly to the upper margin of the head, with which it is connected by a chitinous thickening. Hind margin of antennal groove lined with about twenty small, short hairs. Back of antennal groove on disk of vertex there are three bristles, one large, and two smaller. Hind margin of head with the normal bristles, about ten smaller with the usual larger ones at lower angles. Labial palpi equaling anterior trochanters.

Pronotum with a transverse row of about twelve good-sized bristles, those at lateral angles far larger; on the hind margin occurs a ctenidium of eighteen stout spines. Meso- and metanotum each with two transverse rows of bristles, the posterior row with eight to ten larger ones. Metathoracic epiphysis with three rows of two bristles each. Abdominal tergites each with two rows of bristles, the larger rows with twelve to fourteen bristles each. Hind margin of metanotum with two small teeth on each side, first tergite with two on each side, and second and third tergites with one on each side. Only one well-developed antepygidial bristle occurs on each side, the other two being abortive. Abdominal sternites with two bristles only, on each side.

Lateral portion of ninth tergite with a thumb-shaped lobe, and the usual two bristles over insertion of claspers. The claspers are slender

above and round tipped, but suddenly and broadly dilated backward, below. On the hind margin of this dilation are three stout, black teeth, the two upper short, the lower of nearly same diameter, but four times as long. The ventral style is long and slender, but armed only with a single short bristle. Eighth tergite laterally with a number of stout bristles, a row of four or five heavier ones in middle of hind margin being especially noteworthy.

Hind coxæ without minute teeth inside. Hind femora with a row of about four bristles along the side. Spines on apex of second joint of hind tarsi shorter than third joint. Fifth tarsal joint with the first pair of spines dislocated toward median line, though not strongly so. Length of joints of hind tarsi in the proportions: 23–16.5–9–5–9.

Length, 2.2 mm. Color, pale brown.

Type.—Cat. No. 6911, U.S.N.M.

CERATOPHYLLUS ASIO, new species.

From Prof. A. P. Morse comes a single female specimen taken at Wellesley, Massachusetts, on *Megascops asio*. There can be little doubt that this occurrence is accidental and that the species is normally parasitic on some small rodent of that region. But so far this specimen is the only representative seen of a very distinct species.

Head rather strongly rounded from occiput to the distinct apical notch. Of the three stout bristles in the lower row in the gena the first and second are nearly equal in size and smaller than that on lower margin of head. The upper row of six small bristles extends from lower margin of head to high on antennal groove. Gena below eye rather acute posteriorly. Antennal groove extending to two-thirds depth of head, strongly narrowed below, the hind margin with numerous minute bristles especially near the lower angle. First antennal joint with two transverse rows of minute hairs, second with about five bristles which nearly equal the third joint. Back of the middle of antennal groove occurs one large bristle, and back and above this are about six smaller bristles; this arrangement alone clearly distinguishing this species from others nearly related. The bristles on hind margin of head are unusually strong. There are two at lateral angle, the lower smaller.

On the body all the bristles near the median dorsal line are unusually long and stout. Pronotum with two transverse rows of bristles, the one on posterior third of about twelve larger bristles, the anterior of fewer and smaller ones. The hind margin of pronotum with a ctenidium of about twenty stout spines. The meso and metanotum each have three rows of bristles, the posterior row of about twelve larger bristles, the second row about the same number of small bristles, and the third row with still fewer and smaller bristles. Metathoracic epiphysis with two heavy bristles on hind margin, two smaller anterior

to these, and a third row of three. Abdominal tergites each with two transverse rows of bristles, the posterior of sixteen or eighteen larger ones, the anterior of fewer and smaller bristles. Metanotum and first four abdominal tergites each with a small tooth on either side. Antepygidial spines three on each side, the middle one of each group scarcely extending over pygidium. Beneath pygidium on either side stand two short bristles. Hind margin of lateral portion of eighth segment with two stout bristles and anterior to these two smaller ones.

Style twice longer than wide at the somewhat swollen base, narrowing to a tip, where there is a long bristle; back of tip there is a bristle on upper margin and also one on lower margin.

Hind coxa without minute teeth on inner surface. Hind femur with one small bristle on side. Apical spines on second hind tarsal joint shorter than third joint. First pair of spines on last hind tarsal joint inserted nearly in a line with the others, but somewhat bent inward. Lengths of mid tarsal joints in the proportions 16–13–7.5–5–11.

Length, 3.25 mm. Color, clear brown.

Type.—Cat. No. 6912, U.S.N.M.

CERATOPHYLLUS CANADENSIS, new species.

Plate XX, figs. 1–4.

Several years ago Dr. J. Fletcher sent me a single female specimen from Ottawa, Canada, which could not be placed with any described species. I was loath to describe it at that time, not having made special studies of the female sexual characters, and especially because the host was not given. It is characterized here in the hope that the host will soon be determined and the male found.

Head rapidly roundly sloping from occiput to frontal notch, which is rather low down on the front. Eye large, nearly elliptical in outline. Gena with a lower row of three stout bristles, the middle smallest; the second row is represented by two small bristles in a line above upper bristle of lower row. Gena below eye obtusely pointed posteriorly. Antennal groove reaching two-thirds the depth of the head, rather strongly narrowed below, with a number of scattering minute hairs along the posterior margin. The bristles on second antennal joint are about five in number and nearly equal third joint. On disk of vertex back of antennal groove stands one stout bristle. Hind margin of head with the usual bristles, but with a single stout one at lower angle. Labial palpi nearly equaling anterior trochanters.

Pronotum with a transverse row of about twelve bristles on posterior third, the hind margin with a ctenidium of about twenty stout spines. Meso- and metanotum each with two distinct rows of bristles and some scattering small bristles in front of these; the posterior row contains about twelve larger bristles, the next more and smaller ones. Metanotum with two small teeth on either side of hind margin, the

first abdominal tergite with one, second with two, and third with one, on either side. Abdominal tergites each with two transverse rows of bristles, the posterior row of about fourteen stouter, the anterior of fewer and much smaller, while still in front of these latter may be found a few scattering bristles. Abdominal sternites each with about five bristles on either side. Antepygidial bristles three on each side, the middle one of each set longest, reaching over pygidium, the inner smallest. Below the pygidium laterally are two stout bristles. Hind margin of eighth segment laterally narrowly rounded and lined by about eight stout bristles.

Style stout, twice longer than wide at base, narrowing to the apex where there is a long bristle; proximad of apical bristle on under side is a smaller bristle. Substylar flap obtusely pointed, with some long bristles near the tip and a brush of shorter stouter ones on the lower margin.

Hind coxæ without minute teeth on the side. Hind femur with a longitudinal row of five or six small bristles on the side. Apical spines on second joint of hind tarsi shorter than the third joint. Third hind tarsal joint with but two groups of spines on each side. Fifth hind tarsal joint with first pair of spines inserted nearly in a line with the others, but bent inward. Joints of hind tarsi slender, their lengths in the proportion 22–14.5–9.5–5–9.

Length, 3 mm. Color, clear brown.

Type.—Cat. No. 6913, U.S.N.M.

CERATOPHYLLUS VISON, new species.

Mr. Gerrit S. Miller jr., took this species on *Putorius vison* at Peterboro, New York. Prof. F. L. Harvey also found one specimen of it at Orono, Maine, on *Sciurus hudsonicus*. It is closely related to other squirrel fleas, but a greater number of specimens were taken from *Putorius*. In this, as in some other cases, only a number of observations will determine the normal host. The specimens from *Putorius* furnish the types.

Female: Upper margin of head evenly rounded from occiput to frontal notch, which is rather low down on the front. The middle bristle in the lower row of three on gena is nearly as stout and long as the upper one. The upper oblique row of five small bristles extends from the margin of antennal groove to the lower margin of the head. A few minute hairs occur above the oval eye, which is of medium size and rather low down in the head. Gena below eye suddenly narrowed posteriorly from the rather broad portion immediately below eye to a somewhat acute point. Antennal groove extending to two-thirds the depth of the head, and but slightly narrowed below, its hind margin prominent and with scattering minute hairs. The first antennal joint with several transverse rows of minute hairs; the

five or six bristles on second antennal joint shorter than third joint. Disk of vertex back of middle of antennal groove with one large, stout bristle and two small ones. Hind margin of head with the usual bristles, a small supernumerary bristle occurring just below the large one at each lower angle. Labial palpi extending to one-fourth of anterior femora.

Pronotum with a transverse row of about twelve unusually stout bristles on posterior third and on hind margin a ctenidium of about twenty stout spines. Meso- and metanotum each with two rows of bristles on posterior half, the posterior row of about ten larger bristles, the anterior of a somewhat greater number of smaller ones. Metanotum and first three abdominal tergites each with a small tooth on either side of hind margin. Metathoracic epiphysis with one bristle on hind margin; anterior to this a row containing one large and two smaller ones; still anterior to this row occur two small bristles. Abdominal tergites each with two rows of bristles, the posterior row of about fourteen larger ones, the anterior of fewer and smaller ones. Middle sternites each with four bristles on either side. Antepygidial spines three on each side, the middle one of each group extending to the end of the pygidium, the inner and outer scarcely half the length of the middle one. Beneath the pygidium on either side occur two large bristles and one small one. The hind margin of eighth segment laterally is lined with about six large bristles.

Style stout, the length not twice the width at base, rapidly narrowing to the apex where there is a long bristle; proximad of the apical bristle there is another on the upper margin and also one on the lower margin. Substylar flap obtuse, with two stout bristles near the apex, and four or five short, stout ones on the lower surface.

Hind coxæ without minute teeth on inner surface. Hind femur with two small bristles on the side. Apical spines on second hind tarsal joint shorter than the third joint. The third joint of hind tarsi has three groups of spines on either side. First pair of spines on fifth joint of hind tarsi inserted on a line with the others, but bent inward. Lengths of hind tarsal joints in the proportion 25–15–10–5–10.5. Length, 3.25 mm. Color, clear brown.

Male: Head flattened above as usual, the front gently rounded. Antepygidial spines with the central one of each group as in the female, but the inner and outer aborted. On the sides the eighth segment is obtusely extended posteriorly, the upper margin of this portion with about five stout bristles, none on the lower margin, but a number on the disk. Lateral portion of ninth tergite with a slender thumb-shaped lobe, which is twice longer than wide, the two bristles over insertion of claspers standing very close together.

The upper claspers are large, subrectangular above the thick pedicel, the rectangular portion about twice longer than wide and twice the

length of the lobe of the ninth tergite. The upper posterior angle of claspers is rounded and with two slender bristles; below this angle stands a short, stout, dark-colored, downward-curved bristle, while another like it also occurs at the roundly, slightly extended lower angle. Length, 2.5 mm.

Type.—Cat. No. 6914, U.S.N.M.

CERATOPHYLLUS LUCIDUS, new species.

Plate XX, figs. 5–9.

While camped near Pagosa Peak, in southern Colorado, during 1899, at an elevation of about 9,000 feet, I found that the little spruce squirrels so abundant there were commonly infested with a flea which differs from any of the other squirrel fleas, though closely related to *vison*.

Female: Margin of head above strongly and evenly rounded from occiput to mouth. The frontal notch is inconspicuous. Of the bristles in the lower row on gena the middle one is smallest. The upper row consists of about five bristles, and extends from the antennal groove to the lower margin of the head. Gena below eye broadly subtruncate posteriorly. Above the strongly ovate eye are a few minute hairs. The antennal groove extends to two-thirds the depth of the head, and is somewhat narrowed below, the hind margin with a very few minute hairs above and below. First antennal joint with a few short hairs near the apex, the second joint having about five bristles, which are shorter than third joint. On the disk of the vertex back of the middle of the antennal groove occurs one stout bristle and two smaller ones. Hind margin of head with the usual bristles, and also with a small supernumerary bristle beneath the large one at each lower angle. Labial palpi equaling or a little exceeding the anterior trochanters.

Pronotum with a transverse row of about ten bristles on the posterior third, and on the hind margin a ctenidium of about sixteen stout spines. Meso- and metanotum posteriorly each with a row of about ten stronger bristles, anterior to which is a row of fewer smaller bristles. Metathoracic epiphysis with one large bristle on the hind margin, one large and two small bristles in front of this, and two still smaller in front of the latter. Metanotum and first three abdominal sternites each with a small tooth on either side of hind margin. Middle abdominal tergites each with a row of about twelve larger bristles, and anterior to this a row of fewer smaller bristles. Sternites each with a row of six to ten bristles. Antepygidial bristles three on each side, the central one in each group about twice longer than the others, but scarcely projecting beyond the pygidium. Below the pygidium on each side occur two bristles.

Style short and stout, not twice longer than wide at base, narrowing to the apex, where there is a long bristle; proximad of the apical bristle occurs one on upper and another on lower margin.

Hind coxa without minute teeth inside. Hind femur with one minute bristle on side. Spines on apex of second hind tarsal joint shorter than third joint. Third joint of hind tarsi with two groups of spines on either margin. First pair of spines on last joint of hind tarsi inserted on a line with the others, but somewhat bent inward. Length of hind tarsal joints in the proportions 20–13–8–5–9.

Length, 3 mm. Color, dark, almost blackish, brown.

Male: Head flattened above as usual. The genital organs are very similar in structure to those of *vison*. Length, 2.25 mm.

Type.—Cat. No. 6915, U.S.N.M.

CERATOPHYLLUS MONTANUS Baker.

Plate XXII, figs. 7–8, and Plate XXIII, figs. 1–5.

Originally taken from the gray squirrel in the northern Colorado mountains; this species has since been found in southern Colorado and in Arizona. In southern Colorado, at Arboles, I found it abundant on Rock Squirrel, and in Arizona, Hubbard collected a series on Rock Squirrel in the Santa Rita Mountains. In addition to the original description, further details are indicated in the accompanying figures and synopsis.

CERATOPHYLLUS ARCTOMYS, new species.

Plate XXII, figs. 1–6.

At Peterboro, New York, Mr. Gerrit S. Miller, jr., of the U. S. National Museum, has collected a large and distinct species, on *Arctomys monax*, which is related to *montanus*, possessing like it the greatly elongated mouthparts, but differing in the much greater size and various details.

Female: Head with a rather broadly evenly rounded outline above, the frontal notch distinct. The gena with two oblique rows of bristles—three in each. A few minute hairs occur above the small oval eye. Gena below eye truncate posteriorly. Bristles on second joint of antennæ exceeding third joint. Hind margin of antennal groove lined with a number of small hairs. On disk of vertex, back of middle of antennal groove, stands a single large stout bristle. Hind margin of head with two or three bristles above; somewhat above lower angle occurs a large, long bristle, beneath which stands one or two small supernumerary bristles. The labial palpi extend nearly to end of anterior femora.

Pronotum with a transverse row of about fourteen bristles on posterior third and on hind margin a ctenidium of eighteen or twenty stout spines. The anterior row of bristles on meso- and metanotum contains about ten small bristles; on mesonotum posteriorly there is a row of about twelve larger bristles, and on metanotum a row of sixteen. On the hind margin of the metathoracic epiphysis stands one large

bristle, anterior to this a second large one, and still anterior to the second two smaller ones. The hind margin of metanotum and first four abdominal tergites each with two small teeth on either side. The rows of larger bristles on abdominal tergites number about as follows: I—14, II—24, III—22, IV—16, V—18, VI—20, VII—18. Antepygidial bristles, three on each side, the central one in each group extending beyond pygidium; the outer in each group five-sixths as long as the central, the inner slightly more than a third as long. Posterior rows of bristles on abdominal sternites with from eight to sixteen bristles; an anterior row is represented by one or two median bristles. The end of the abdomen is very bristly. Beneath the pygidium on either side stand four stout bristles. The tenth tergite is unusually well covered with medium sized and small bristles.

The style is short and unusually stout, not twice longer than broad, thickest at middle, but little narrowed at the tip, where there is a long bristle; back of the apical are several shorter bristles. The substylar flap is almost hidden in long strong bristles, and the lateral portion of eighth segment bears many.

The hind coxæ are without minute teeth on the inside. The hind femur has a row of about twelve strong bristles on the side. A bristle on either side of apex of second joint of hind tarsi extends beyond third joint. The spines on fifth tarsal joint are arranged in the typical *Ceratophyllus* manner.

Length, 3.75–4 mm. Color, clear brown.

Male: Head flattened above in the usual manner. Antennal groove reaching upper margin of head. But one long bristle occurs in the antepygidial groups, the other two being aborted. Hind margin of eighth segment above with about eight stout spines, and in front of these are scattered a number others of equal size. Lateral portion of ninth segment with its lobe short, thick at base, and rapidly tapered above to an obtuse point. Apparently only one bristle occurs over the insertion of the claspers. Upper claspers with a stout pedicel, the limb rather large, somewhat reversed thumb-shaped, the rounded hind margin with about five small bristles. The ventral style is long and dilated toward the tip, where there are two long bristles, the lower margin bearing a row of several smaller bristles.

Length, 2.75 mm.

Type.—Cat. No. 6916, U.S.N.M.

CERATOPHYLLUS PROXIMUS, new species.

Plate XIX, figs. 1–5.

From southern California come only females of another spermophile flea, which differ in various characters from any spermophile flea previously examined. Mr. H. G. Hubbard collected it at Palm Springs.

Female: Head normally rounded from occiput to mouth, with a dis-

tinct frontal notch. Gena with the normal lower row of three bristles, the middle one of the row weakest, the upper row represented by one bristle near the margin. No minute hairs occur above the eye. Gena below eye obliquely truncated posteriorly. Hind margin of antennal groove with a very few small hairs. Hind margin of head with the usual bristles, and one on the disk of the vertex behind the middle of the antennal groove. Labial palpi reaching beyond the middle of the anterior femora.

Pronotum with a transverse row of about ten bristles and a ctenidium of sixteen stout spines. Meso- and metanotum with two rows of bristles each, the principal row, in both cases, composed of about twelve bristles. Hind margin of metanotum with four small dark-colored teeth. Abdominal tergites each with two rows of bristles, the principal row of fourteen to sixteen bristles. Antepygidial bristles three on each side, two larger of nearly equal length, and one smaller near the median line in each group. Hind margins of first and second abdominal tergites with a single small dark tooth on each side. Abdominal sternites each with six or seven bristles on either side, the seventh and eighth only with two rows. Just beneath the pygidium on either side are two stout bristles. Tenth tergite with scattering small bristles, which are larger toward the tip.

Style rather short, swollen toward the base and narrowed to the tip, where there is one long bristle, back of which are two small bristles, one above and one below. Substylar flaps thickly bristled, the longest bristles being apical.

Hind coxæ without minute teeth within. Hind femur with a row of four or five bristles on the side. One of the apical spines on joint ii of hind tarsi extends to one-half of fifth joint. The last tarsal joint has five spines on either margin, but the first pair are slightly bent inward. Lengths of hind tarsal joints in the proportion 24–10–7–5–9.

Length, 2.5 mm. Color, clear brown.

Type.—Cat. No. 6917, U.S.N.M.

CERATOPHYLLUS BRUNERI Baker.

Plate XXV, figs. 1–5.

This species was originally described from *Citellus 13-lineatus* and *C. franklini*. We have no new records to add, as some of the supposedly new records have turned out to refer to different species. Additional structural details may be made out from the figures and synopsis.

CERATOPHYLLUS IDAHOENSIS, new species.

Plate XVIII, figs. 1–6.

Four specimens which Professor Aldrich took on *Citellus columbianus* at Moscow, Idaho, represent two perfectly distinct species,

and fortunately a male and a female of each. The smaller (*tuberculatus*) has been described (p. 393); the other is a larger species, lacking the frontal tubercle and differing in various other details.

Female: Head broadly rounded from occiput to frontal notch, which is minute and inconspicuous. The lower row of genal bristles with three members, the middle a little higher than the others and much smaller. The upper row is represented by one rather small bristle on the margin. The gena, below the eye, is posteriorly broad and truncate. Antennal groove with a number of small rather stout hairs on the hind margin. The second joint of antenna with about ten bristles, which extend beyond third joint. The hind margin of the head has two or three bristles above and the usual stout one on either side below. One spine occurs on the disk of the vertex behind the middle of the antennal groove. The mandibles extend to one-third of the anterior femora.

The thoracic tergites each have a transverse row of about twelve stout bristles and one distinct row of smaller ones. The pronotum has the usual long spine on each lateral angle and on the hind margin a ctenidium of about twenty stout black spines. The bristles on the abdomen are all unusually long and stout. Most of the tergites have about eighteen bristles in the principal row, and sixteen to twenty in the smaller row. The metanotum and first two tergites each with two small teeth on either side of hind margin. Antepygidial bristles three on each side, the inner in each group shortest, the middle longest, though not exceeding pygidium. Most of the sternites have a principal row of about twelve stout bristles, and four or six bristles in a second row. Beneath the pygidium on either side there are four large bristles, the two outer shorter. The eighth segment on either side below with about three rows of four bristles each.

Style slightly swollen below and narrowed to the apex, where there is a long, stout bristle, below which is a shorter one; behind the apical bristle is a transverse row of still shorter ones. Substylar flap with several longer bristles at the tip and a dense brush of short bristles on the lower margin.

Hind coxæ without minute teeth inside. Hind femur with a longitudinal row of about nine minute bristles on the side. A spine on the apex of second joint of hind tarsi equals joint III and IV together. Spines on under side of fifth tarsal joint similarly placed in rows of five on either margin. Lengths of hind tarsal joints in the proportion 19–11–8–5–9. Length 3.5 mm.

Male: Head flattened and thickened above in the usual manner. Middle bristle in lower row on gena longer than in female. Two bristles occur in upper row, the first above the first of the lower row. The bristles on the hind margin of the antennal groove are larger and fewer than in female. Only one large antepygidial bristle occurs on either

side, and this extends to the apex of the abdomen; the other two bristles normally occurring in each group are here reduced to minute hairs. The eighth segment on either side bears about three rows of four or five stout bristles each. Lateral portion of ninth tergite with the apical lobe short, very much broadened at base, and with a few weak hairs at tip. The upper claspers resemble those of *tuberculatus*. The ventral style has several very long, rather stout bristles.

Length, 2.5 mm. Color, clear brown.

Type.—Cat. No. 6918, U.S.N.M.

CERATOPHYLLUS ARIZONENSIS Baker.

Plate XXIII, fig. 6, and Plate XXIV, figs. 8–12.

This species was based on a single male specimen taken by Mr. Hubbard from the nest of *Neotoma albigula* at Tucson, Arizona. Additional structural details are brought out in the figures and synopsis.

CERATOPHYLLUS PETIOLATUS, new species.

Plate XVIII, figs. 7–11.

This is one of several peculiar things which Professor Aldrich found on *Lynx canadensis* at Moscow, Idaho, though its occurrence on that host is undoubtedly wholly fortuitous. It but still more emphatically indicates the great need of a careful collection of the species normal to the many small rodents. This species is closely related to *Arizonensis*. It is represented in the collection by one male specimen. I at first took it to be the male of *tuberculatus*, but the far greater length of labial palpi and mandibles in the latter species, together with other minor differences not considered sexual, make such a reference impossible.

Head flattened above as usual. The frontal notch is prominent, somewhat as in *tuberculatus*. Gena with a normal lower row of three bristles, the upper row represented by one bristle on the lower margin of head and one near the antennal groove. Gena below the eye obtusely pointed posteriorly. Antennal groove nearly reaching the upper margin of the head, its hind margin with a scattering row of minute bristles slightly back from the edge. Second joint of antennæ with seven or eight bristles which are nearly as long as the third joint. On the disk of the vertex back of the middle of the antennal groove there is one stout bristle. On the hind margin of the head occur the usual bristles, with one long, stout one at each lower angle. The labial palpi extend to the end of the anterior coxæ.

The pronotum has a transverse row of about fourteen bristles on the posterior third and on the hind margin a ctenidium of about twenty stout spines. The meso- and metanotum each have two rows of bristles, the posterior row in each case of twelve or fourteen stouter

bristles. The metathoracic epiphysis has one bristle at the posterior angle and two others in front of this; still anterior to the latter and somewhat above occur three more. Hind margins of metanotum and first and second abdominal tergites each with two small teeth on either side; the third tergite has one on either side. The middle abdominal tergites each with about twenty larger bristles in the posterior row, fewer smaller ones in the anterior row. But one long antepygidial bristle occurs on either side, the others being aborted. Lateral portions of eighth segment with numerous bristles in two thick-set lots near the hind margin, the upper lot of about sixteen smaller bristles, the lower lot of about twenty larger, longer ones.

Lateral portion of ninth tergite very large, the lobe very large, scarcely narrowed toward tip, and extending as far dorsad as do the claspers. The two bristles over the insertion of the claspers are rather far up on the margin and somewhat separated. The upper claspers are long and narrow; inner margin nearly straight, the outer rounded and with four bristles. Above, the claspers are squarely truncate across the tip and obliquely so toward the hind margin.

Hind coxa without minute teeth inside. The hind femur has a longitudinal row of about ten small hairs on side. First tarsal joint with five groups of spines on either side. Spines on apex of second joint of hind tarsi longer than joints ii and iii together. Spines on fifth tarsal joint arranged after the normal Ceratophyllus manner. Lengths of joints of hind tarsi in the proportions 15–10.5–6–5–6.5.

Length, 2.5 mm. Color, pale brown, darker dorsally.

Type.—Cat. No. 6919, U.S.N.M.

CERATOPHYLLUS IGNOTUS Baker.

Plate XXI, figs. 1–6.

The American mole flea was originally described from specimens taken in Iowa, Colorado, and Idaho, on *Geomys bursarius* and *Thomomys talpoides*, under two names. The eyes are rudimentary. A certain portion of the material with eyes fairly distinct was placed in *Pulex ignotus*. Later, additional material, with the eyes almost entirely wanting pigment, was described as *Typhlopsylla americana*. The former name takes precedence. This but illustrates the impossibility of using the comparative development of the eye as a primary generic character.

CERATOPHYLLUS DIVISUS Baker.

Plate XXI, figs. 7–10.

This was originally described from specimens collected by Professor Bruner on Fremont's Chickaree, in Colorado, as *Pulex longispinus*, which name had, however, been previously used by Wagner.

CERATOPHYLLUS COLORADENSIS Baker.

Plate XXV, figs. 6–9.

This was originally collected with *dirisus*. It is, however, far larger and differs in many characters which can scarcely be secondary sexual characters, judging from experience with many other species. Further collections of both species are great desiderata. A careful comparison of synopsis and drawings will show the conspicuous differences.

CERATOPHYLLUS EREMICUS, new species.

There have been in the collection for some time two female specimens collected from a nest of *Peromyscus eremicus* in the foothills of the Santa Rita Mountains, Arizona, by Mr. H. G. Hubbard. By reason of the greatly elongate first joint of hind tarsi this species is closely related to *coloradensis*, but it possesses a number of very distinctive features.

Upper margin of head a broad, sloping curve from occiput to frontal notch, which is distinct though minute. Lower row of three bristles on gena with the middle bristle scarcely half the length of the others, the upper even with, though somewhat removed from, the small somewhat oblong eye. Superior row also of three bristles, the upper one not near the edge of the antennal groove, the middle one very minute, and the lower much smaller than the upper. Gena below the eye obtusely pointed posteriorly. Antennal groove reaching scarcely two-thirds the depth of the head; the hind margins with a number of minute, irregularly placed hairs. Bristles on second joint of antennæ very small and short, not half the length of the third joint. Disk of vertex back of middle of antennal groove with one large bristle. Hind margin of head with the usual bristles, one large one at each lower angle.

Pronotum with a row of about twelve bristles on the posterior third and on the hind margin a ctenidium of about eighteen stout spines. Meso- and metanotum each with a row of about ten larger bristles, anterior to which are several illy defined rows of very minute bristles. Metathoracic epiphysis with one larger bristle on the posterior border, two in front of this, and three in front of and above the latter. Metanotum and first and third abdominal tergites each with one small tooth on either side, the second tergite having two on either side. The middle abdominal tergites have each a row of about twelve larger bristles, and anterior to this a row of about the same number of smaller ones. Antepygidial bristles, three on each side, the middle in each group longest, the inner shortest. Abdominal sternites each with one row of six bristles, though the sixth and seventh show two or four

minute bristles in the position of the second row. The end of the abdomen is provided with comparatively very few bristles. Beneath the pygidium on either side occurs one long and one short bristle.

The style is very broad at base and rapidly narrowed to the apex, where there is a single bristle, proximad of which on the lower margin stands a smaller bristle. Substylar flap rather long, obtusely pointed, with two long bristles near the tip and about four short, stout bristles on the lower margin. Lateral portion of eighth segment near hind margin with scattering small bristles.

Hind coxæ without minute teeth inside. Hind femur with one small bristle on the side dorsally. First joint of hind tarsi with five groups of spines on the anterior border and six on the posterior. Apical spines on second joint of hind tarsi not exceeding the third joint. First pair of spines on fifth tarsal joint slightly dislocated toward median line and directed straight distad. Lengths of hind tarsal joints in the proportions 28–11–6.5–5–10.

Length, 2.75 mm. Color, pale brown.

Type.—Cat. No. 6920, U.S.N.M.

CERATOPHYLLUS STYLOSUS, new species.

Plate XIV, figs. 1–7, and Plate XV, figs. 1–2.

This species is the largest of the order in America, and of most anomalous structure. It was collected at Astoria, Oregon, on *Aplodontia rufa*, by Dr. A. K. Fisher, of the U. S. Biological Survey. There is no doubt but that in the still further division of this genus which must come this will form a separate genus by itself. Viewed in the broad sense in which these genera are here treated, it may be placed in *Ceratophyllus* temporarily, though in most of its characters it is absolutely unique and stands alone. It has some affinities with *Hystrichopsylla*.

Female: Head evenly, rather strongly rounded from the occiput to the deeply cut frontal notch. Save for a slight thickening in the chitin at the edge of the antennal groove, the eye is totally wanting. The lower row of genal bristles consists of five stout bristles distributed between the margin of the antennal groove and the lower margin of the head. Above this the second oblique row consists of about six much smaller bristles. The lower margin of gena is strongly sinuate, and the posterior prolongation is narrowly rounded or very obtusely pointed. The antennal groove extends to two-thirds the depth of the head, the anterior margin greatly thickened, the posterior margin not sharply defined and covered by a large number of minute hairs. The first antennal joint has three transverse rows of short bristles on outside; the second joint bears about ten bristles which do not extend to half the length of the third. The disk of the vertex back of the middle of the antennal groove with an oblique row of bristles, consisting of one large bristle near the antennal groove and about six

smaller ones, the row extending upward and backward. Hind margin of head with about eighteen bristles, one at each lower angle, and one above this within the lower angle, large and long. Mouth parts large and long, the labial palpi slightly exceeding anterior trochanters.

Pronotum with a transverse row of about twenty small bristles near hind margin, and on hind margin a ctenidium of about thirty stout spines. Meso- and metanotum each with a row of about eighteen larger bristles posteriorly, and anterior to this three more or less clearly defined rows of minute bristles. Metathoracic epiphysis with two bristles on the posterior margin, in front of which is a row of about six, and still in front of the latter a row of about three bristles. First abdominal tergite with two short teeth on either side, second with three, and third with two on either side. Abdominal tergites each with a transverse row of about twenty stronger bristles and an anterior row of fewer and far smaller bristles. Antepygidial bristles four on each side, the two middle of each group longest, but not surpassing the pygidium. Sometimes an extra bristle may occur in one or both groups. Between the two groups of antepygidial bristles, the seventh segment is slightly, medially, angularly produced caudad. Abdominal sternites each with one row of stout bristles (of about twenty-four bristles on each middle sternite), which curves cephalad laterally, and in front of this two very irregular rows of smaller and far fewer bristles.

The end of the abdomen is clothed with rather numerous small bristles, two stouter ones occurring on either side beneath the pygidium. The style is small, twice longer than broad, almost perfectly cylindrical, and with two bristles at the tip. Substylar flap small, with several long bristles at tip and a number of shorter stouter ones on lower margin. Tenth tergite with numerous weak bristles, and hind margin of eighth segment below with numerous bristles.

Hind coxa without minute teeth inside. Hind femur with about two irregular rows of many small bristles on the side. The tibial spines are similar to those of others of the genus, but there are a greater number of bristles on the side of the tibia than occurs in other species. The tarsal joints are not more slender than usual. The first hind tarsal joint with six groups of spines on either margin. The spines on the apex of the second hind tarsal joint shorter than the third joint. First pair of spines on the last tarsal joint somewhat dislocated inward and incurved, though not projecting straight distad. Lengths of hind tarsal joints in the proportions 25–13.5–8.5–5–9.5.

Length, 5.75 mm. Color, clear brown.

Male: Head flattened above in the usual manner. The antennal groove reaches the upper margin of the head. The first abdominal tergite has three teeth on either side of hind margin, the outer on each side quite long; the second tergite has four or five of about equal length on either side; the third has three on either side and the fourth

one or two. Antepygidial bristles three on each side, the middle in each group longest and far exceeding pygidium, the inner shortest. Between the two groups of antepygidial bristles there projects caudad over one-third of pygidium a narrowly triangular median prolongation of the seventh tergite, in which character this species differs from any other known species of the order. The eighth segment is large laterally and subrectangular posteriorly; the hind margin above has numerous medium-sized bristles and below is provided with a brush of numerous long, fine, and soft hairs.

The lateral portion of the ninth tergite bears three bristles over insertion of upper clasper and is extended dorsally into a slightly recurved, rather sharp triangular lobe. Upper claspers very large, obtriangular, the upper margin with a thick-set row of rather numerous, quite uniform bristles.

Length, 5.5 mm.

Type.—Cat. No. 6921, U.S.N.M.

Genus CTENOPHTHALMUS Kolenati.

1857. *Ctenophthalmus* KOLENATI, Die Parasiten der Chiropteren, p. 33.
1863. *Ctenophthalmus* KOLENATI, Horæ Ent. Soc. Ross., II, p. 35.

This genus differs from *Ceratophyllus* in very much the same way that *Ctenocephalus* does from *Pulex*—by the possession of ctenidia on the genæ. As has been noted under *Ceratophyllus*, the characters indicated by Wagner can not be used for the division of the American species. As known at present, the genus is not well represented in America, though any generalizations of this sort are premature, owing to the very desultory character of the collecting which has been done. Doubtless many other species will be found infesting our moles and shrews.

SYNOPSIS OF AMERICAN SPECIES.

a. Head ctenidia of one tooth on either side; size large ..... *gigas* (p. 421).
aa. Head ctenidia of three to five teeth on either side; size small.
  b. Spines of head ctenidia in longitudinal rows on lower margins of genæ, three on each side; the last joint of the hind tarsi with only three well-developed spines on either margin ..... *pseudagyrtes* (p. 421).
  bb. Spines of head ctenidia in vertical rows on hind margins of genæ, four or five on each side; the last joint of hind tarsi with four well-developed spines on either side, at least in *fraternus* and *genalis*.
    c. Spines of head ctenidia very similar in shape; pronotal ctenidium of twenty to twenty-two spines.
      d. Head ctenidia each of four spines; head evenly rounded in front; antennal grooves connected by a furrow over top of head (male); front with a marginal row of six bristles on each side ..... *intermedius* (p. 423).
      dd. Head ctenidia each of five spines; head angulate in front; antennal grooves not connected by a furrow over top of head (male); front without marginal bristles ..... *fraternus* (p. 423).
    cc. Spines of head ctenidia very dissimilar in shape; pronotal ctenidium of about twenty-eight spines ..... *genalis* (p. 424).

CTENOPHTHALMUS GIGAS (Kirby).

The attempt to employ this name, based as it was on an unrecognizable description, was perhaps unwise. At the time it was done some Canadian and Northern United States fleas were in the collection, and this was the only one which at all fitted the original description as to size. It was collected by myself at Agricultural College, Michigan, on *Lepus*. Later, two northern species of *Hystrichopsylla* came to hand, either of which might have been referred to under this name with equal propriety, so far as the description is concerned. Only an examination of the type can settle the matter, and this may still be in existence in the British Museum. In the meantime the matter will be allowed to stand just as it is in order to avoid any additional confusion. In addition to the characters given in the first description, the following may be noted:

Female: The upper and lower rows of genal bristles are continued obliquely on to the vertex in the manner so characteristic of this genus—on the vertex about six bristles occurring above and about eight below. A pigmented eye is wholly wanting. Hind margin of antennal groove with a single row of small hairs.

The pronotum has two rows of bristles, and the meso- and metanotum three or four each. The first and second abdominal tergites each have two small teeth on either side, and the third one on either side. End of abdomen very heavily bristled. Antepygidial bristles three on each side and very large, the middle one in each set longest.

Style long and slender, about three times as long as wide at base, nearly cylindrical, with a long bristle at apex, and just back of this two minute ones. The fourth pair of spines on last joint of hind tarsi are aborted, so that there are only four pairs of well-developed spines, as in *Pulex*.

CTENOPHTHALMUS PSEUDAGYRTES, new species.

Plate XI, figs. 7–12.

Although in the Preliminary Studies this species was referred to a varietal form of *assimilis*, yet later it became a very doubtful reference. The appearance of Rothschild's study of the European *agyrtes* confirmed the suspicions as to its distinctness. It differs from *agyrtes* more especially in the armature of the first joint of the hind tarsi and in the genitalia. Specimens are now in the collection from *Geomys bursarius* at Agricultural College, Michigan (Baker), from *Scalops argentatus* at Ames, Iowa (Osborn), from nest of field mouse at Ithaca, New York (MacGillivray), and from *Megascops asio* at Wellesley, Massachusetts (Morse). The last-mentioned occurrence is to be considered as wholly accidental. The Michigan specimens are taken as types.

Female: Head broadly evenly rounded from occiput to mouth. The frontal notch is distinct by reason of a thickening of the chitinous crust at this point. Gena with an upper row of about five bristles (uppermost largest), a middle row of three larger ones, and a row of three heavy dark-colored ctenidial teeth on lower margin. The eye is represented by a scarcely pigmented thickening of the chitin on the margin of the antennal groove. The antennal groove extends to three-fourths the depth of the head and is connected with that on opposite side, across the top of the head, by a fine groove flanked with chitinous thickenings. The lower row of bristles on the vertex is represented by one large bristle back of the middle of the antennal groove; the upper row consists of four strong bristles standing in a slightly oblique line. Antennal groove strongly narrowed below, its hind margin near the lower edge of the head covered by a patch of numerous minute bristles. Labial palpi reaching to three-fourths of anterior coxæ.

Pronotum with a row of about fourteen bristles on posterior third, and on hind margin a ctenidium of about fourteen long stout spines. Meso- and metanotum each with three rows of bristles, the posterior of about twelve large bristles, the next of fewer and smaller bristles. Metathoracic scale with two vertical rows of three bristles each. First, second, and third abdominal tergites each with a small tooth on either side of hind margin. Abdominal tergites each with two distinct rows of bristles, and anteriorly a third row represented by a few bristles; there are about twelve larger bristles in the posterior row on middle tergites, varying to four in this row on the eighth tergite. Antepygidial bristles three on each side, the middle in each group longest, the inner shortest. Middle abdominal sternites each with about ten bristles in the principal row, in front of which are scattered remnants of two other rows, one to three bristles each.

The end of the abdomen is only moderately bristled. No stout bristles occur on either side just below pygidium. The tenth tergite dorsally bears numerous small bristles. The style is two and a half times as long as broad at base, and narrowed to the slender tip, where there is a long bristle. The substylar flap has two long bristles near the apex and a few short stout ones on the lower margin. The eighth segment possesses a number of bristles below.

Hind coxa without minute teeth on inside. Hind femur without minute hairs on side. The first joint of hind tarsi has six sets of spines on anterior margin and five sets on posterior margin. One spine on apex of joint II of hind tarsi somewhat exceeding joint III. First pair of spines on fifth tarsal joint strongly dislocated toward median line and directed straight distad; the fourth pair are aborted, occurring as fine hairs only. Length of hind tarsal joints in the proportions 18.5–13.5–8.5–5–8.5.

Length, 3 mm. Color, pale brown.

Male: Head flattened above or even a little depressed. Upper row of bristles on vertex dislocated at middle, two bristles being lower than the other two. The inner and outer spines in each group of antepygidial bristles are considerably smaller than the middle one, though not reduced to hairs.

Lateral portion of ninth tergite two-lobed, the upper lobe very short and bluntly rounded and with three long bristles on the posterior margin; lower lobe as in *agyrtes*, with one bristle over the insertion of the claspers. Upper claspers rather long, parallel sided, the outer upper angle obtusely pointed, the upper inner angle broadly obliquely rounded and here margined with a number of small hairs; on the hind margin are several minute hairs near the upper end, and several small bristles below.

Length, 1.75 mm.

Type.—Cat. No. 6922, U.S.N.M.

CTENOPHTHALMUS INTERMEDIUS (Wagner).

This species—described as a *Typhlopsylla* by Dr. Wagner—was collected on *Metachirus opossum* in Paraguay and Ecuador. It is an interesting addition to the American fauna, very distinct from anything previously described. The structure of the head strongly suggests *Ctenopsyllus*, but the tibial spines and other characters are those of *Ctenophthalmus*.

CTENOPHTHALMUS FRATERNUS Baker.

This species is known only from the type, a single female taken at Brookings, South Dakota, by Professor Aldrich. He did not give the host, though it is quite likely to prove to be one of the moles. As the original characterization was somewhat meager, the following descriptive notes are added:

The head is broadly rounded from the occiput to the prominent frontal notch, and thence slopes downward and backward to the mouth, giving the head an angulated appearance. A row of six bristles occurs high upon the gena; below this a row of two large and one small bristle, and on lower posterior portion of gena a ctenidium parallel to the upper rows of bristles and composed of five large, stout, dark-colored spines, the middle three longest. The antennal groove reaches to three-fourths the depth of the head, is not connected with the opposite antennal groove by a furrow passing over the top, and is without minute hairs or bristles scattered along the posterior margin. On the disk of the vertex occur extensions of the two rows of bristles on gena—about seven bristles above and eight below. Hind margin of head with the usual bristles. Labial palpi equaling three-fourths of anterior coxæ, the apex of the last joint having the usual minute hairs except that posteriorly on each palpus one is much enlarged and hooked.

Pronotum with a row of about twelve bristles on the posterior third, and on the hind margin a ctenidium of about twenty stout spines. Meso- and metanotum each with a row of ten or twelve larger bristles and a second row of more numerous smaller ones. Metathoracic epiphysis with a single bristle on the hind margin, and anterior to this two rows of three bristles each. The middle abdominal tergites each have a transverse row of fourteen larger bristles, and a second row of more numerous smaller ones. First abdominal tergite with three small teeth on either side of hind margin, second, third, and fourth each with two on either side, and fifth and sixth each with one. Antepygidial bristles badly broken in this specimen, but there are apparently only two on either side. The abdominal sternites each have a single row of from four to six large bristles.

The end of the abdomen is rather heavily clothed with bristles. The style is about three times as long as wide at base, nearly cylindrical, and with a long bristle at apex. The substylar flap has a thick brush of hairs on the lower margin.

The hind coxæ have a group of numerous small, short, somewhat thickened bristles on the inside, which resemble the grouped teeth occurring here in some *Pulex* and *Ctenophyllus*. Hind femur with a single small bristle on side near base. The spines on hind legs are unusually long. The first joint of the hind tarsi has five groups of spines on either margin; the last joint with but eight heavy spines, four on either margin. Hind tarsi mutilated in this specimen, but lengths of middle tarsal joints in the proportion 12–11–7–5–12.

Length, 2.25 mm. Color, pale brown.

CTENOPHTHALMUS GENALIS, new species.

A species collected on *Geomys bursarius* at the Agricultural College of Michigan, and formerly supposed to be a variety of *fraterna*, is now considered wholly distinct and described herewith from a single male.

Head somewhat flattened above. Rows of genal bristles pushed high up on head. The insertions of the five irregular ctenidial spines occupy half the surface of the genæ. These ctenidial spines are very dissimilar, the middle three longer, the upper distinctly spatulate, and the next one slightly so. The bristles on the second antennal joint are far shorter than the third joint. The antennal groove reaches the upper margin of the head, and its hind margin is without minute bristles or hairs. The upper row on either side of vertex has about four bristles, the second row about six. The hind margin of the head has the usual bristles. The labial palpi are slender and equal three-fourths of anterior coxæ. The maxillary palpi are unusually short and thick.

Pronotum with a row of about twelve bristles on posterior third, and on hind margin a ctenidium of about twenty-eight slender spines.

Mesonotum with a single row of about twelve bristles. Metanotum with a row of about twelve larger bristles, and behind this, on either side, three smaller ones. Metathoracic epiphysis with one large bristle posteriorly, two anterior to this, and one small, short one in front of the latter. First abdominal tergite with a single small tooth on either side, second with three on either side, third with two, and fourth with one on either side. Abdominal tergites each with a transverse row of ten bristles, and on the first two or three segments a second row of one to three bristles on a side. One stout antepygidial bristle mounted on a tubercle on each side. Middle abdominal sternites each with a single row of six bristles.

Lateral portion of ninth tergite greatly enlarged and triangular, long-pointed backward. Upper claspers rather small, not extending beyond tip of prolonged portion of ninth tergite, somewhat spatulate, the inner upper angle acute, the outer upper angle broadly rounded, the hind margin with six to eight bristles; on the inside at base there is separated a short, broad, acute piece like a large tooth.

Hind coxæ with a group of short stout bristles on inside, resembling the similarly grouped teeth in *Pulex*. Hind femur with a single bristle on inside. The first joint of the hind tarsi has four groups of spines on either margin; the apical spines on the second joint are shorter than the third joint. The fifth tarsal joint on first and second tarsi have five spines on either margin as in typical *Ceratophyllus*, while on the fifth joint of hind tarsi there are but four on either margin as in *Pulex*. Lengths of hind tarsal joint in the proportions 23–15–10–5–12.

Length, 2.25 mm. Color, pale brown.

Type.—Cat. No. 6923, U.S.N.M.

Genus ANOMIOPSYLLUS, new genus.

This genus is founded on an insect which I described in 1898 as *Typhlopsylla nudata*. It then dropped into that convenient "catch-all" *Typhlopsylla*, on account of its lack of eyes, though it was remarked at that time that it represented a distinct genus. One of the most conspicuous characters is the great length of the maxillary palpi, which exceed the fore coxæ. The eyes are wholly wanting. On the dorsal line the pronotum and mesonotum are of equal length, while the metanotum is shorter. There is a remarkable and wholly unique reduction in the vestiture, the body, excepting the posterior extremity, being almost wholly nude, and the number of spines on the legs greatly reduced, there being but four pairs of spines on the posterior margin of the tibiæ. One of the most important characters is found in the rounded emargination formed distally on the hind margin of fore and middle coxæ at the juncture of the coxa and its epiphysis. In most fleas this is shallow or wanting, with the outer subtending

limb obtuse. In this case it is very deep, deeper than broad, and the outer subtending limb is narrowly acute. On the fifth tarsal joints are combined the characters of two of the Wagnerian genera; on the fore and middle last tarsal joints the first pair of spines is dislocated toward the median line and directed straight distad. On the hind last tarsal joint there are but four spines on either side.

While I am somewhat loath to separate any new genera at this time when the inflow of strange and aberrant forms has just begun, still, in this case there is hardly any other course open to me, for otherwise *nudata* might be placed with equal propriety in any one of two or three genera.

ANOMIOPSYLLUS NUDATUS Baker.

This species, the smallest known American flea, was originally described from two females collected at Tucson, Arizona, in a nest of *Neotoma albigula* by the late Mr. Hubbard, who was one of the most thorough collectors America has yet seen. In addition to the characterization originally given, the following additional details may be noted:

The lower row of genal bristles is represented by one very weak and slender bristle on margin of antennal groove and a similar one on the lower margin of the head. There are no other bristles on the head excepting one or two at each lower angle of hind margin, and a very few short ones on second antennal joint. The thorax is without bristles excepting one on either side of pronotum at each lateral angle.

The abdominal tergites each have a single row of about six very weak and slender bristles. One small and slender antepygidial bristle occurs on either side. The hairs on pygidium are very fine, but longer than usual.

Style about three times longer than wide at base, and slightly narrowed to the tip, where there is a long bristle. The substylar flap is long and acute and has numerous bristles on the lower margin. Below the substylar flap a number of short, stout bristles occur near the margin.

The first joint of the hind tarsi has four groups of spines on the anterior margin and two groups on the posterior margin. One of the spines on apex of second joint of hind tarsi posteriorly is very long and slender, extending nearly to the end of the last joint. Lengths of hind tarsal joints in the proportions 18–10–6–5–10.

Length, 2 mm. Color, pale brown.

Genus CTENOPSYLLUS Kolenati.

1863. *Ctenopsyllus* Kolenati, Horæ Soc. Ent. Ross., II, p. 37.
1893. *Ctenopsyllus* Wagner, Horæ Soc. Ent. Ross., XXVII, p. 350.

This is preeminently the genus of mouse and rat fleas. Elsewhere has been noted the extreme paucity of knowledge on the American

forms, and also the great probability of some of the European species having been introduced. If these are found anywhere it will be in or near our great ports, and from these localities we have no specimens collected on house mice or rats.

SYNOPSIS OF AMERICAN SPECIES.

a. Head without ctenidial spines ..... *alpinus* (p. 427).
aa. Head with ctenidia.
b. Head ctenidia of two spines each ..... *hesperomys* (p. 428).
bb. Head ctenidia of four spines each ..... *mexicanus* (p. 430).

CTENOPSYLLUS ALPINUS Baker.

This species is still known only from the types—a male and female collected by Professor Bruner at Georgetown, Colorado, on *Neotoma*. It is congeneric with *musculi*, showing the same peculiar type of head, but it has no genal ctenidia. The following descriptive notes are added:

Female: Head gently rounded or nearly flat above from occiput to frontal noteh (which is very high on the front), thence sloping downward and backward to the mouth. The bristles on the head are developed into short, stout, dark-colored spines, all of which project downward and backward. The antennal groove extends to about two-thirds the depth of the head, and above is connected by a chitinous thickening and furrow across the top of the head with the antennal groove on opposite side. Near the margin of the front on either side, extending from mouth to antennal groove, is a row of ten short, stout spines. There are only two spines in the normal lower row on gena. The upper row has six spines, but instead of stopping above at the antennal groove this row curves around cephalad nearly to the margin of the front. Disk of vertex on each side with three oblique rows of spines, an upper one of two spines, a middle of three, and a lower one of five spines. The antennal groove is somewhat contracted below, and is without minute hairs or bristles on the posterior margin. The labial palpi extend to one-third of the anterior femora.

Pronotum with a row of about twelve stout bristles on the posterior third, and on the hind margin a ctenidium of about eighteen or twenty spines. The usual soft and minute articulatory hairs on anterior margin of mesonotum are here small teeth. Meso- and metanotum each with a transverse row of about eight bristles. Metathoracic epiphysis with about ten irregularly placed bristles.

First abdominal tergite with three or four small teeth on either side of hind margin. The abdominal tergites each has a transverse row of about ten bristles. Antepygidial bristles three on each side, the middle one in each group slightly longer. Abdominal sternites each with a row of about ten rather strong and close-set bristles. The eighth segment, near the middle of hind margin on either side, with a

group of several long, and several short, stout bristles. One stout bristle occurs beneath the pygidium on either side.

The style is very long, about five times as long as broad at base, nearly cylindrical, except at the tip, where there is a weak bristle, back of which are about six bristles irregularly placed. Substylar flap with numerous short, stout bristles above and three very heavy ones on the lower margin.

The hind coxal epiphysis slopes gradually into the coxa distally, thus not forming any emargination. The hind femur is without minute bristles on side. Hind margin of hind tibia with about six distant longer inner spines and about twelve shorter close-set inner ones.

First joint of hind tarsi without paired spines on hind margin, but with a double row of numerous spines. Bristles on apex of second hind tarsal joint shorter than third joint. The first pair of spines on fifth tarsal joint is dislocated toward median line and directed straight caudad.

Length, 2.5 mm.

Male: Head nearly as in the female, but the antennal groove extends to its upper margin. The two outer in each group of antepygidial bristles somewhat reduced. The last five abdominal sternites only, have rows of six bristles each.

The lateral portion of ninth tergite is without a lobe on the upper margin. The upper claspers are long, narrow, subrectangular, curved backward a little, and with two black teeth at the upper posterior angle. Lower claspers with a short, stout, black, recurved spine on hind margin.

Length, 1.5 mm.

CTENOPSYLLUS HESPEROMYS, new species.

There is in the collection a *Ctenopsyllus* taken at Franconia, New Hampshire, on *Peromyscus*, by Mrs. A. T. Slosson, which represents a very distinct species in that it possesses a ctenidium of two spines on either side of the head.

The upper margin of the head is very gradually rounded from the occiput to the frontal notch, thence curved downward and backward to the mouth. The antennal groove is margined by chitinous thickenings above and is narrowed to the upper margin of the head, where it joins the groove of the other side. The marginal row of bristles usual to this genus occurs on either side of the head; from the frontal notch to the mouth these bristles are short and heavy and spine-like; from the frontal notch to the occiput they are much longer and bristle-like. The upper row of genal bristles is represented by two placed high up; below this is a row of three bristles, two of which are very strong—one over eye, the other considerably above lower margin of head. Beneath the eye on either side, standing in a vertical row, are two

short, heavy ctenidial spines directed downward and backward. On either side of disk of vertex are three oblique rows of small bristles, the upper with five bristles, the middle of six, and the lower of three. The usual bristles occur on the hind margin of the head, the larger one at each lower angle being unusually short and stout. The few bristles on the second antennal joint are shorter than the third joint. There are six or eight minute bristles along the hind margin of the antennal groove. In the position of the eye occurs a dark thickening of the chitin. The mouth parts are unusually short, the labial palpi extending little more than one-half of anterior coxæ. The maxillæ are not more than twice as long as broad.

The mesonotum is twice as long on the dorsal line as either pronotum or metanotum. On the posterior third of the pronotum occurs a transverse row of about twelve bristles, and on the hind margin a ctenidium of about thirty slender spines, the row curving downward and backward laterally. Meso- and metanotum each with a larger row of about ten bristles and anterior to this about three rows of numerous very irregularly placed smaller bristles. Metathoracic epiphysis with one bristle on hind border, and anterior to this two rows of five bristles each.

Hind margins of dorsal segments with small teeth as follows: Six on metanotum, six on first abdominal tergite, six on second, two on third, two on fourth, and two on fifth. The abdominal tergites each have a row of about fourteen larger bristles and a second row of fewer smaller ones. Antepygidial bristles all unusually long and stout, the longest in each set of three nearly equaling the pygidium. The abdominal sternites each have one transverse row of six bristles. The extremity of abdomen is moderately bristled. One stout bristle occurs beneath the pygidium on either side.

The style is short and stout, not twice as long as wide at the base, with one long bristle at the apex and several short ones proximad of it on lower margin. The substylar flap is obtusely but symmetrically pointed and clothed with eight or ten bristles of varying sizes about the apical margin. The eighth segment laterally near the lower portion of the hind margin bears a number of long and a number of shorter bristles.

The hind coxæ are without bristles or teeth on the inside. Hind femur with but a single bristle on the side. Hind tibiæ with three long spines on hind margin and a close-set row of twelve shorter ones. The spines on apex of joint II of hind tarsi are shorter than joint III. First pair of spines on fifth tarsal joint dislocated toward median line and directed straight caudad. Length of hind tarsal joints in the proportions 25–10.5–8.5–5–7.

Length, 2.5 mm. Color, pale brown.

Type.—Cat. No. 6924, U.S.N.M.

CTENOPSYLLUS MEXICANUS Baker.

It was expected that the flea found on *Mus rattus* at Guanajuato, Mexico, by Dr. Dugès, would turn out to be some European species. It proved, however, to differ materially from anything described. Later, Dr. Dugès sent further material from *Mus norvegicus* taken at the same place. The following notes may be added to the original description:

Female: Dorsal segments with small teeth on hind margins as follows: Six on metanotum, six on first abdominal tergite, four on second, four on third, and two on the fourth. Antepygidial bristles four in each set, the first inner one and third shortest, second longest and largest, fourth nearly as long as second. One stout bristle occurs on either side below pygidium.

The style is rather long and narrow, the length twice the width at base, narrowing gradually to the apex, where there is a long bristle; another bristle nearly as large occurs on the lower margin. The substylar flap has a number of bristles near the apex, mostly on lower margin.

The hind margin of posterior tibæ bears three long spines and a close-set straight row of about fifteen short spines. The apical spines on second joint of hind tarsi are shorter than the third joint. The first pair of spines on last joint of hind tarsi dislocated toward median line and directed straight caudad.

Length, 2.5 mm. Color, pale brown.

Male: Antepygidial bristles, three on either side; the middle one of each group longest. The eighth segment on either side below bears but five bristles.

The lateral portion of the ninth tergite is strongly constricted below the pygidium, then expanded into a symmetrically rounded limb which in outline is shaped like a pestle. There is but a single bristle over the insertion of the claspers. The upper claspers are small but stout, thumb-shaped, with the ball of the thumb turned caudad, not extending above the lateral portion of the ninth tergite, and with four or five bristles on the hind margin.

Length, 2 mm.

Genus STEPHANOCIRCUS Skuse.

1890. *Stephanocircus* Skuse, Records of Austral. Mus., II, p. 77, pl. xvii.
1895. *Stephanocircus* Baker, Canad. Ent., XXVII, p. 63.
1896. *Stephanocircus* Skuse, Records of Austral. Mus., II, p. 7.

The original description of this remarkable genus came to me just as the Preliminary Studies were being published. I copied the description and remarked that it presented such an anomalous structure and such a remarkable case of sexual dimorphism that I would not attempt to place it in Taschenberg's system, which I was then com-

pelled to follow. The male and female, even though properly associated, would fall in different genera, perhaps, according to all that Taschenberg had given us in the characterization of genera.

Mr. Skuse took deep umbrage at my wholly innocent remarks and the next year presented a "rejoinder," in which he reasserts the specific identity of the male and female. Beyond this one statement, his paper was principally taken up with personal criticisms. There was not the faintest intention on my part to attempt passing *Stephanocircus* "under the heel"—the organism will still continue to exist in its original status, no matter what either of us may write about it. In copying the description at all there was no other motive than a desire for more knowledge concerning it. I was unfortunate in not having had access to the plates. The simple fact concerning Mr. Skuse's description is that out of it all he presents in the generic characterization but a single diagnostic generic character—that of the pectinated "cap-like patella" on the head—the other characters being common to other genera, either separately or in combination. I was not able at that time to interpret even this clearly from the description alone, as some species of *Ctenopsyllus* presented a similar general appearance. Indeed, the male of *Stephanocircus* is apparently a *Ctenopsyllus*, as that genus is commonly known. The matter of four-jointed antennæ must certainly be reexamined. If such a character is presented, then this species must be made the type of a new family differing from all other known fleas. But in the description of the apparently congeneric *Stephanocircus mars*, Rothschild says nothing about four-jointed antennæ, and his drawing does not show four joints. Some of the characters given by Mr. Skuse in the generic description are of specific value only, and the length of thorax given in the specific diagnosis is a character usually of generic value. Other than this, his specific description is not at all diagnostic.

Mr. Skuse, in this connection, criticises me also for not being able to place the flea *Echidnophaga ambulans*. But I could not do anything with it until a fuller and more exact morphological study was made and a real generic diagnosis presented.

The genus *Stephanocircus* now possesses far greater interest for American students on account of the recent publication of

STEPHANOCIRCUS MARS Rothschild.

This species was collected on a "*Hesperomys*" in Argentina by Dr. Berg, and is known from a single female in the Rothschild collection. It is greatly to be regretted that the male could not have also passed under Mr. Rothschild's critical eye. The occurrence of this genus also in South America is a matter of great interest. It is of interest to note that a greater number of striking cases of sexual dimorphism occur in South American fleas than in those of any other country.

Genus HYSTRICHOPSYLLA Taschenberg.

1880. *Hystrichopsylla* Taschenberg, Die Flöhe, p. 83.
1895. *Hystrichopsylla* Baker, Canad. Ent., XXVII, p. 186.

Taschenberg based this genus on the remarkable flea originally named *Pulex talpæ* by Curtis, which is the *obtusiceps* of Ritsema (but not the *talpæ* of Bouché, which is *bisoctodentatus* Kolenati). The species seems to have been unknown to Kolenati, or he would certainly have given it a separate generic designation. The genus remained monotypic until the description of

HYSTRICHOPSYLLA AMERICANA Baker.

This species is represented in the collection by a single female collected on an *Evotomys* at Orono, Maine, by the late Prof. F. L. Harvey. Although evidently congeneric with the European species, it shows very wide specific differences. The head lacks the flattened, calloused front as illustrated by Taschenberg, and the pronotum is by far the longest thoracic segment. However, the specimen, figured in "Die Flöhe," is a male, while our unique type is a female. A complete study of both sexes of this species is much to be desired.

Dr. Fletcher has sent to me from Nepigon, Canada, a dried and badly mutilated specimen of a large, totally new flea, apparently of this genus, which presents a still wider divergence. It was taken, I understand, on a sandy lake shore, near which its host probably lives. I hesitate to describe it from this material, and yet am loath to leave unrecorded such an interesting addition to our fauna.

Genus CERATOPSYLLUS Curtis.

1832. *Ceratopsyllus* Curtis, Brit. Entomolog., X.
1833. *Ceratopsyllus* Westwood (Ischnopsyllus) Ent. Mo. Mag., I, p. 359.
1863. *Ceratopsyllus* Kolenati, Horæ Soc. Ent. Ross., II, p. 39.
1893. *Ceratopsyllus* Wagner, Horæ Soc. Ent. Ross., XXVII, p. 350.
1898. *Ceratopsyllus* Wagner, Horæ Soc. Ent. Ross., XXXI, p. 580.
1898. *Ceratopsyllus* Rothschild, Novitates Zoologicæ, V, p. 542.

The species of this genus—the most distinctly marked genus in the *Pulicidæ*—are confined to bats. Unquestionably, species belonging here will be found in North and South America. I regret not to be able to record a single one.

LIST OF SIPHONAPTERA OF THE WORLD, WITH BIBLIOGRAPHY, HOSTS,[a] AND HABITATS.

To January 1, 1903.

Family SARCOPSYLLIDÆ Taschenberg.

Genus SARCOPSYLLA Westwood.

SARCOPSYLLA PENETRANS (Linnaeus) Westwood.

1743. Catesbey, Nat. Hist. of Carolina, Florida, and Bahama Islands, III, app., p. 10, fig. 3. (*Pulex minimus cutem penetrans.*)
1743. Barrère, Nouv. Relation de la France equinoxiale, p. 63. (*Pulex minutissimus nigricans.*)
1756. Patrick Brown, Nat. Hist. of Jamaica, II, p. 418. (*Acarus fuscus sub cutem nidulans proboscide acutiore.*)
1758. Linnaeus, Syst. Nat., 10th ed., p. 614. (*Pulex penetrans.*)
1788. Swartz, Kongl. vetensk. Acad. Nya. Handl., IX, p. 40. (*Pulex penetrans.*)
1815. Oken, Naturgesch. f. alle Stände, III, p. 402. (*Rhynchoprion penetrans.*)
1821. Pohl, Reisen in Brasilien, I, p. 106. (*Pulex penetrans.*)
1823. Duméril, Considerations gener. sur la classe des Insectes, pl. LIV, figs. 4–5. (*Pulex penetrans.*)
1826. Duméril, Dict. scienc. nat., XLIV, p. 82. Atlas, pl. LIII, figs. 4–5. (*Pulex penetrans.*)
1829. Guerin, Iconograph. d. règne animal Insectes. Text. expl., p. 12, pl. II. (*Dermatophilus penetrans.*)
1832. Pohl and Kollar, Brasiliens vorzüglich lästige Insecten, p. 8. (*Pulex penetrans.*)
1836. Shuckard, Ann. Mag. Nat. Hist., p. 129, pl. VII. (*Pulex penetrans.*)
1837–40. Westwood, Trans. Ent. Soc., II, p. 199, pl. XX. (*Sarcopsylla penetrans.*)
1844. Gervais, Hist. nat. d. Ins. Aptères, III, p. 368, pl. XLIX, fig. 11. (*Pulex penetrans.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 28. (*Sarcopsylla penetrans.*)
1864. Karsten, Beitr. z. Kennt. d. Rhynchoprion penetrans.
1867. Bonnet, Mémoire sur la Puce penetrante au Chique. (*Pulex penetrans.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 76. (*Pulex penetrans.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., p. 181. (*Pulex penetrans.*)
1880. Taschenberg, Die Flöhe, p. 44. (*Sarcopsylla penetrans.*)
1895. Baker, Canad. Ent., XXIII, p. 20. (*Sarcopsylla penetrans.*)
1896. Osborn, Div. Ent. Dept. Agrcl. Bull. No. 5 (n. s.), p. 142, fig. LXII. (*Sarcopsylla penetrans.*)

Hosts: Man and the domesticated animals and some others.
Habitat: Tropical regions of both hemispheres.

[a] In the descriptive portion of the text the hosts are referred to under names used by Taschenberg, Wagner, Rothschild, and the various collectors who have sent in specimens. These names are necessarily in great confusion and represent many schools of nomenclature. In this list these same names are referred to again in the bibliography. Through the kindness of Mr. Gerrit S. Miller, jr., of the U. S. National Museum, the host names are also given according to the current nomenclature, thus reducing all the names to one system and in such a manner as to make the references plain in every case.

Genus XESTOPSYLLA Baker.

XESTOPSYLLA GALLINACEA (Westwood) Baker.

1874–75. Westwood, The Entom. Mo. Mag., XI, p. 246. (*Sarcopsylla gallinacea.*)
1880. Taschenberg, Die Flöhe, p. 55, pl. 1, fig. 5. (*Sarcopsylla gallinacea.*)
1890. Johnson, Proc. Ent. Soc. Wash., I, p. 203. (*Pulex pallulorum.*)
1895. Baker, Canad. Ent., XXVII, p. 20. (*Sarcopsylla gallinacea.*)
1896. Osborn, Div. Ent. Dept. Agrcl., Bull. No. 5 (n. s.), p. 144, figs. 76–77. (*Sarcopsylla gallinacea.*)

Hosts: Domesticated animals, especially chickens.
Habitat: Warmer portions of America and Africa.

Family HECTOPSYLLIDÆ Baker.

Genus HECTOPSYLLA Frauenfeld.

HECTOPSYLLA PSITTACI Frauenfeld.

1860. Frauenfeld, Sitzungsb. d. k. Acad. d. Wiss. Wien., XI, p. 462. (*Hectopsylla psittaci.*)
1880. Haller, Archiv. f. Naturgesch., Jahr. 46, p. 72, pl. IV. (*Rhynchopsylla pulex.*)
1880. Taschenberg, Die Flöhe, p. 5. (*Rhynchopsylla pulex.*) Hosts, "*Psittacus* and *Molossus.*"
1895. Baker, Canad. Ent., XXVII, p. 21. (*Rhynchopsylla pulex.*)

Hosts: Psittacus and *Nyctinomus.*
Habitat: Ceylon.

Family VERMIPSYLLIDÆ Wagner.

Genus VERMIPSYLLA Schimkewitsch.

VERMIPYSLLA ALACURT Schimkewitsch.

1885. Schimkewitsch, Zool. Anz., no. 187.
1889. Wagner, Horæ Soc. Ent. Ross., XXIII, nos. 1–2, p. 205.
1895. Baker, Canad. Ent., XXVII, p. 22.

Hosts: The ungulates.
Habitat: Western Asia.

Family MEGAPSYLLIDÆ Baker.

Genus MEGAPSYLLA Baker.

MEGAPSYLLA GROSSIVENTRIS (Weyenbergh) Baker.

1879. Weyenbergh, Bull. de la Acad. Nac. de Ciencias Republ. Argent., III, p. 188. (*Pulex grossiventris.*)
1880. Taschenberg, Die Flöhe, p. 101. (*Pulex grossiventris.*)
1895. Baker, Can. Ent., XXVII, p. 3. (*Sarcopsylla grossiventris.*)
1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 53. (*Megapsylla grossiventris.*)

Host: Zaëdyus minutus.
Habitat: Argentine Republic.

Family PULICIDÆ.

Genus PULEX Linnaeus.

PULEX ANOMALUS Baker.

1903. Baker, see p. 381.

Host: *Citellus.*
Habitat: Southern Colorado.

PULEX AFFINIS Baker.

1903. Baker, see p. 382.

Host: *Lepus.*
Habitat: Arizona.

PULEX BOHLSII Wagner.

1900. Wagner, Horæ Soc. Ent. Ross., XXXV, p. 5.

Host: ———.
Habitat: Paraguay.

PULEX BRASILIENSIS Baker.

1903. Baker, see p. 379. Host, "*Mus rattus* and *Mus decumanus.*"

Host: *Mus rattus* and *Mus norvegicus.*
Habitat: Sao Paulo, Brazil.

PULEX CUSPIDATUS Kolenati.

1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 33.
1893. Wagner, Horæ Soc. Ent. Ross. XXVII, p. 9.

Host: *Erinaceus europæus.*
Habitat: Europe.

PULEX DUGESII Baker.

1899. Baker, Ent. News, Feb., p. 37. (*Pulex irritans* var. *dugesii.*) Host, "*Spermophilus macrourus.*"

Host: *Citellus macrourus.*
Habitat: Mexico.

PULEX ECHIDNÆ Denny.

1840. Westwood, Mod. Classif. Insects, II, p. 493.
1843. Denny, Ann. and Mag. Nat. Hist., XII, p. 315, pl. xxvii, fig. 6. Host, "*Echidna hystrix.*"
1844. Gervais, Hist. nat. d. Ins. Aptères, III, p. 374.
1874. Ritsema, Regensb. Correspondenzblatt, XXVIII, p. 79.
1880. Ritsema, Zeitsch. f. ges. Naturwiss., LIII, p. 185.
1880. Taschenberg, Die Flöhe, p. 98.
1895. Baker, Canad. Ent., XXVII, p. 130.

Host: *Tachyglossus aculeatus.*
Habitat: Van Diemans Land.

PULEX GLACIALIS Taschenberg.

1880. Taschenberg, Die Flöhe, p. 76, pl. III, fig. 17.
1895. Baker, Canad. Ent., XXVII, p. 111 (ex. Amer. spec.).

Host: *Lepus "glacialis."*
Habitat: "Nord Pole."

PULEX HYÆNÆ Kolenati.

1846. Kolenati, Meletemata Entomologica, Pt. 5, p. 26, pl. XIX, fig. 1.
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 30. (*Pulex striatus.*)
1874. Ritsema, Regensb. Correspondenzblatt, XXVIII, p. 77.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 184.
1880. Taschenberg, Die Flöhe, p. 100.

Host: *Hyæna striata.*
Habitat: Transcaucasia, Persia.

PULEX IRRITANS Linnæus.

1746. Linnæus, Fauna suecica, 2d ed., No. 1695.
1746. Linnæus, Fauna suecica, 1st ed., No. 1471. (*Pulex ater.*)
1762. Geoffroy, Hist. abrégée d. Ins., II, p. 614, pl, XX, fig. 4.
1778. Degeer, Mem. p. servir. a l'hist. d. Ins., VII, p. 1, pl. 1, figs. 1–4. (*Pulex vulgaris.*)
1832. Dugès, Ann. d. science nat., XXVII, p. 147, pl. IV, fig. 1.
1832. Dugès, Ann. d. science nat., p. 163. (*Pulex hominis.*)
1832. Bouché, Nov. Act. Acad. Leop. Carol., XVII, p. 503.
1844. Gervais, Hist. nat. d. Ins. Apt., III, p. 365.
1855. Küchenmeister, Parasiten, I, p. 452.
1856. Walker, Dipt. Brit., III, p. 2.
1858. Maitland, Herklots Bouwstoff., p. 310.
1859. Kolenati, Fauna d. Altvaters, p. 65.
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 31, fig. 2.
1873. Ritsema, Tijds. v. Entomol., 2d ser., VIII, p. lxxxiv.
1874. Ritsema, Regensb. Corresp., XXVII, p. 76.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., p. 181.
1880. Taschenberg, Die Flöhe, p. 64.
1895. Baker, Canad. Ent., XXVII, p. 66. (*Pulex irritans* and *P. simulans.*)
1896. Osborn, Div. Ent., Dept. Agr., Bull. No. 5 (n. s.), p. 147, fig. 80. (*Pulex irritans* and *P. simulans.*)

Hosts: *Homo, Vulpes, Didelphis, Canis, Felis,* etc.
Habitat: Temperate and tropical regions of the world.

PULEX JACULANS Motschulsky.

1840. Motschulsky, Bull. Soc. Imp. des Nat. de Moscou, p. 170. Host, "*Dipus jaculus.*"
1880. Taschenberg, Die Flöhe, p. 105.

Host: *Alactaga jaculus.*
Habitat: Siberia.

PULEX KERGUELENSIS Taschenberg.

1880. Taschenberg, Die Flöhe, p. 67, pl. II, fig. 12.
1895. Baker, Canad. Ent., XXVII, p. 65.

Host: "*Pelecanoides urinatrix*," fide Taschenberg.
Habitat: Kerguelen Island.

PULEX LAMELLIFER Wagner.

1895. Wagner, Horæ Soc. Ent. Ross., XXIX, p. 1, fig. 1.
1895. Baker, Journ. N. Y. Ent. Soc., VI, p. 54.

Host: Some rodent.
Habitat: Transcaspia.

PULEX LEMMUS Motschulsky.

1840. Motschulsky, Bull. Soc. Imp. des Nat. de Moscou, p. 170. Host, "*Myodes lemmus.*"
1880. Taschenberg, Die Flöhe, p. 105.

Host: *Lemmus* sp.
Habitat: ? Siberia.

PULEX LONGISPINUS Wagner.

1893. Wagner, Horæ Soc. Ent. Ross., XXVII, p. 9, pl. IV, fig. 1. Host, "*Erinaceus europæus.*"
1895. Baker, Journ. N. Y. Ent. Soc., VI, p. 54.

Host: *Erinaceus* sp.
Habitat: West Turkestan.

PULEX LUTZII Baker.

1903. Baker, see p. 380. Host, "*Galictis vittatus.*"

Host: *Grison vittatus.*
Habitat: Sao Paulo, Brazil.

PULEX LYNX Baker.

1903. Baker, see p. 383.

Host: *Lynx canadensis.*
Habitat: Moscow, Idaho.

PULEX MADAGASCARIENSIS Rothschild.

1900. Rothschild, The Ent. Record and Journ. of Variation, XII, no. 2, fig. 3. Host, "*Centetes ecaudatus.*"

Host: *Tenrec ecaudatus.*
Habitat: Madagascar.

PULEX PALLIDUS Taschenberg.

1880. Taschenberg, Die Flöhe, p. 65, pl. I, fig. 9.
1895. Baker, Canad. Ent., XXVII, p. 66.

Hosts: *Herpestes ichneumon* and *Mus albipes.*
Habitat: Egypt and Island of Socotra.

PULEX TUBERCULATICEPS Bezzi.

1890. Bezzi, Bull. della Soc. Entom. Ital., XXII.
1895. Baker, Canad. Ent., XXVII, p. 64.

Host: *Ursus arctos.*
Habitat: Europe.

PULEX VULPES Motschulsky.

1840. Motschulsky, Bull. Soc. imp. de Moscou, p. 170.
1874. Ritsema, Regensb. Corresp., XXVIII, p. 79.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 183.
1880. Taschenberg, Die Flöhe, p. 66, pl. II, figs. 10–11. (*Pulex globiceps.*) Hosts, "*Canis vulpes* and *Meles taxus.*"
1895. Baker, Canad. Ent., XXVII, p. 66. (*Pulex globiceps.*)

Hosts: *Vulpes vulpes* and *Meles meles.*
Habitat: Europe.

Genus CTENOCEPHALUS Kolenati.

CTENOCEPHALUS CANIS (Curtis) Baker.

1749. Roesel, Insektenbelustigungen, II, Muscarum atque culicum, pls. II–IV. (Der so bekannte als beschwerliche Flöh.)
1826. Curtis, Brit. Entom., III, no. 111, fig. 8. (*Pulex canis.*)
1832. Dugès, Ann. d. scienc. nat., XXVII, p. 154, pl. IV, figs. 2, 5–9. (*Pulex canis.*)
1835. Bouché, Nov. Act. Acad. Leop. Carol., XVII, Pt. 1, p. 505. (*Pulex felis.*)
1844. Gervais, Hist. nat. des Insectes, Apt., III, pp. 371–372, pl. XLVIII, fig. 8. (*Pulex canis, P. felis,* and *P. serraticeps.*)
1856. Walker, Dipt. Brit., III, pp. 2–3. (*Pulex canis* and *P. felis.*)
1858. Maitland, Herklots Bouwstoff., II, p. 310. (*Pulex canis* and *P. felis.*)
1859. Kolenati, Fauna d. Altvaters, p. 66. (*Ctenocephalus norvemdentatus* and *C. enneodus.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 45, figs. 14–15. (*Ctenocephalus norvemdentatus* and *C. enneodus.*)
1867. Landois, Nov. Act. Acad. Leop.-Carol., XXXIII, p. 19, pls. I–VII. (*Pulex canis.*)
1873. Ritsema, Tijdsch. v. Entomol., 2d ser., VIII, p. lxxxv. (*Ctenocephalus norvemdentatus* and *C. enneodus.*)
1874. Ritsema, Regensb. Corresp., XXVII, pp. 77–78. (*Pulex canis* and *P. felis.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, pp. 182–183. (*Pulex canis* and *P. felis.*)
1880. Taschenberg, Die Flöhe, p. 77, pl. III, fig. 16. (*Pulex serraticeps.*)
1888. Simmons, Amer. Mo. Micr. Journ., Dec. (*Pulex canis.*)
1895. Baker, Canad. Ent., XXVII, p. 164. (*Pulex serraticeps.*)
1896. Osborn, Div. Ent., Dept. Agrcl., Bull. No. 5 (n. s.), p. 150, fig. 83. (*Pulex serraticeps.*)
1896. Howard and Marlatt, Div. Ent., Dept. Agrcl., Bull. No. 4 (n. s.), p. 24, fig. 5. (*Pulex serraticeps.*)
1901. Rothschild, The Ent. Record and Journ. of Variation, XIII, No. 4, p. 126, pl. III. (*Pulex canis* and *P. felis.*)

Hosts: *Canis familiaris, Urocyon cinereoargenteus, Felis domestica,* etc.
Habitat: Cosmopolitan.

CTENOCEPHALUS ERINACEI (Leach) Baker.

1832. Leach, in Curtis Brit. Ent., IX, no. 417. (*Ceratophyllus erinacei.*)
1835. Bouché, Nov. Act. Acad. Leop.-Carol., XVII, Pt. 1, p. 507. (*Pulex erinacei.*)
1844. Gervais, Hist. nat. d. Ins., Apt., III, p. 373. (*Pulex erinacei.*)
1856. Walker, Insecta Brit., Diptera, III, p. 3. (*Pulex erinacei.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 78. (*Pulex erinacei.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 183. (*Pulex erinacei.*)
1880. Taschenberg, Die Flöhe, p. 81. (*Pulex erinacei.*)
1893. Wagner, Horæ Soc. Ent. Ross., XXVII, p. 9. (*Pulex erinacei.*)
1895. Baker, Canad. Ent., XXVII, p. 164. (*Pulex erinacei.*)

Host: *Erinaceus europæus.*
Habitat: Europe.

CTENOCEPHALUS INÆQUALIS Baker.

1895. Baker, Canad. Ent., XXVII, p. 164. (*Pulex inæqualis.*)
1896. Osborn, Div. Ent., Dept. Agrcl., Bull. No. 5 (n. s.), p. 153, fig. 84. (*Pulex inæqualis.*)

Host: *Lepus.*
Habitat: Arizona.

CTENOCEPHALUS LEPORIS (Leach) Baker.

1832. Leach, in Curtis Brit. Ent., IX, no. 417. (*Ceratophyllus leporis.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 76. (*Pulex leporis.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Pulex leporis.*)
1880. Taschenberg, Die Flöhe, p. 82. (*Pulex goniocephalus.*)
1895. Baker, Canad. Ent., XXVII, p. 165. (*Pulex goniocephalus.*)
1896. Osborn, Div. Ent., Dept. Agrcl., Bull. V, (n. s.), p. 153. (*Pulex goniocephalus.*)

Host: *Lepus* spp.
Habitat: Europe.

CTENOCEPHALUS SIMPLEX Baker.

1895. Baker, Canad. Ent., XXVII, p. 164. (*Pulex inæqualis* var. *simplex.*) Host, "*Lepus sylvaticus.*"
1896. Osborn, Div. Ent., Dept. Agrcl., Bull. V, (n. s.), p. 153. (*Pulex inæqualis* var. *simplex.*)

Host: *Lepus floridanus* subsp.
Habitat: Michigan and Iowa.

Genus ECHIDNOPHAGA Olliff.

ECHIDNOPHAGA AMBULANS Olliff.

1886. Olliff, Proc. Linn. Soc. N. S. Wales (2), I, p. 172. Host, "*Echidna hystrix.*"

Host: *Tachyglossus aculeatus.*
Habitat: New South Wales.

Genus CERATOPHYLLUS Curtis.

CERATOPHYLLUS ALASKENSIS Baker.

1903. Baker, see p. 394.

Host: *Citellus barrowensis.*
Habitat: Point Barrow, Alaska.

CERATOPHYLLUS ARCTOMYS Baker.

1903. Baker, see p. 411.

Host: *Arctomys monax.*
Habitat: Peterboro, New York.

CERATOPHYLLUS ARIZONENSIS Baker.

1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 55. (*Pulex Arizonensis.*) Host, "*Silvery mouse.*"

Host: *Neotoma albigula.*
Habitat: Tucson, Arizona.

CERATOPHYLLUS ARMATUS Wagner.

1900. Wagner, Horæ Soc. Ent. Ross., XXXV, p. 17. Host, "*Pteromys volans.*"

Host: *Sciuropterus russicus.*
Habitat: Siberia.

CERATOPHYLLUS ASIO Baker.

1903. Baker, see p. 406.

Host: *Megascops asio.*
Habitat: Wellesley, Massachusetts.

CERATOPHYLLUS BRUNERI (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, p. 132. (*Pulex bruneri.*) Host, "*Spermophilus 13-lineatus.*"
1896. Osborn, Div. Ent. Dept. Agrcl., Bull. V (n. s.), p. 149, fig. 82. (*Pulex bruneri.*)
1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 55. (*Pulex bruneri.*)

Hosts: *Citellus 13-lineatus, C. franklinii,* and *C. columbianus.*
Habitat: Nebraska and Idaho.

CERATOPHYLLUS CALIFORNICUS Baker.

1903. Baker, see p. 395.

Host: *Microtus californicus.*
Habitat Mountain View, California.

CERATOPHYLLUS CANADENSIS Baker.

1903. Baker, see p. 407.

Host: (?)
Habitat: Ottawa, Canada.

CERATOPHYLLUS CHARLOTTENSIS Baker.

1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 56. (*Pulex charlottensis.*)

Host: "A mouse."
Habitat: Queen Charlotte Islands.

CERATOPHYLLUS CILIATUS Baker.

1903. Baker, see p. 397.

Host: Eutamias.
Habitat: Mountain View, California.

CERATOPHYLLUS COLORADENSIS (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, p. 111. (*Pulex coloradensis.*)

Host: Sciurus fremonti.
Habitat: Colorado.

CERATOPHYLLUS COLUMBÆ (Walckener and Gervais) Rothschild.

1832. Stephens, in Curtis' Brit. Ent., IX, no. 417. (*Nomen nudum.*)
1844. Walckener and Gervais, Hist. Nat. Ins. Aptères., III, p. 375, pl. XLVIII, fig. 7. (*Pulex columbæ.*)
1856. Walker, Diptera Brit., III, p. 5. (*Pulex columbæ.*)
1858. Maitland, Herklots Bouwstoffen, p. 311. (*Pulex columbæ.*)
1874. Ritsema, Regens. Corresp., XXVIII, p. 79. (*Pulex columbæ.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 183. (*Pulex columbæ.*)
1892. Theobald, An Account of British Flies, I, p. 540. (*Pulex columbæ.*)
1900. Rothschild, Novitates Zoologicæ, VII, p. 542.

Host: Columba livia.
Habitat: Europe.

CERATOPHYLLUS CONSIMILIS Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 562, pl. VIII, fig. 11. Host, "*Arvicola.*"

Host: Microtus.
Habitat: Gouv. Charkow, Russia.

CERATOPHYLLUS DENTATUS Baker.

1903. Baker, see p. 390.

Host: Lynx canadensis.
Habitat: Moscow, Idaho.

CERATOPHYLLUS DIVISUS Baker.

1895. Baker, Canad. Ent., XXVII, p. 132. (*Pulex longispinus.*)
1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 54. (*Pulex divisus.*)

Host: Sciurus fremonti.
Habitat: Colorado.

CERATOPHYLLUS DRYAS (Wagner) Baker.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 568, pl. VIII, fig. 4. (*Ceratophyllus sciurorum* var. *dryas.*) Host, "*Myoxus dryas.*"

Host: *Glis nitedula.*
Habitat: Gouv. Waronesch, Russia.

CERATOPHYLLUS EREMICUS Baker.

1903. Baker, see p. 417.

Host: *Peromyscus eremicus.*
Habitat: Santa Rita Mts., Arizona.

CERATOPHYLLUS FASCIATUS (Bosc.) Curtis.

1801. Bosc d'Antic, Bull. Sci. Soc. Phil., III, p. 156, no. 44. (*Pulex fasciatus.*)
1802. Bosc d'Antic, Wiedemann's Archiv., p. 211. (*Pulex fasciatus.*)
1805. Latreille, Hist. Nat. d. Ins., XIV, p. 42. (*Pulex fasciatus.*)
1844. Gervais, Hist. Nat. d. Ins. Aptères, III, p. 373. (*Pulex fasciatus.*)
1832. Curtis, Brit. Ent., IX, no. 417. (*Ceratophyllus fasciatus.*)
1858. Maitland, Herklots Bouwstoffen, p. 310. (*Pulex fasciatus.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 34, fig. 5. (*Ctenopsyllus fasciatus.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 76. (*Pulex fasciatus.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Pulex fasciatus.*)
1880. Taschenberg, Die Flöhe, p. 69. (*Pulex fasciatus.*) Hosts, "*Myoxus nitela, Talpa europæa, Mus musculus* and *Mus decumanus.*"
1895. Baker, Canad. Ent., XXVII, p. 111. (*Pulex fasciatus*, as to European specimens only.)
1896. Osborn, Div. Ent. Dept. Agric., Bull. V (n. s.), p. 148. (*Pulex fasciatus.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 560, pl. VIII, fig. 10.

Hosts: *Eliomys quercinus*, *Talpa europæa*, *Mus musculus*, and *Mus norvegicus.*
Habitat: Europe.

CERATOPHYLLUS FRINGILLÆ (Walker) Baker.

1856. Walker, Dipt. Brit., III, p. 4. (*Pulex fringillæ.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 34. (*Trichopsylla fringillæ.*)
1873. Ritsema, Tijds. v. Entom., XVI, p. 84. (*Trichopsylla fringillæ.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 79. (*Pulex fringillæ.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 184. (*Pulex fringillæ.*)
1892. Theobald, An Account of British Flies, I, p. 32. (*Pulex fringillæ.*)

Hosts: *Passer domesticus* and *Chloris chloris.*
Habitat: Europe.

CERATOPHYLLUS GALLINÆ (Schrank) Wagner.

1804. Schrank, Fauna boica, III, p. 195. (*Pulex gallinæ.*)
1827. Gravenhorst, Uebers. d. Arb. u. veränd. d. Schles. Gesellsch. f. vaterl. Kultur., p. 67. (*Pulex rufus.*)
1835. Bouché, Nov. Act. Acad. Leop. Carol., XVII, Pt. 1, p. 504. (*Pulex gallinæ.*)
1844. Gervais, Hist. Nat. d. Ins. Aptères, III, p. 375. (*Pulex gallinæ.*)
1856. Walker, Dipt. Brit., III, p. 2. (*Pulex gallinæ.*)

1858. Maitland, Herklots Bouwstoffen, p. 11. (*Pulex gallinæ.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 34. (*Trichopsylla gallinæ.*)
1873. Ritsema, Tijdschr. v. Entom., XVI, p. lxxxiv. (*Trichopsylla gallinæ.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 78. (*Pulex gallinæ.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Pulex gallinæ.*)
1880. Taschenberg, Die Flöhe, p. 70. (*Pulex avium.*) Hosts, "*Gallus domesticus, Turdus merula, Erithacus rubicula, Acredula rosea, Columba anas, Mus sylvaticus*, and *Scotophilus noctula.*"
1892. Theobald, An Account of British Flies, I, p. 31. (*Pulex gallinæ.*)
1895. Baker, Canad. Ent., XXVII, p. 110. (*Pulex avium.*)
1896. Osborn, Div. Ent. Dept. Agrcl., Bull. (n. s.), p. 147. (*Pulex avium.*)
1900. Rothschild, Novitates Zoologicæ, VII, p. 540.

Hosts: Gallus domesticus, Merula merula, Erithacus rubecula, Egithalos rosea, Columba anas, Mus sylvaticus, and *Pterygistes noctula.*
Habitat: Europe.

CERATOPHYLLUS HIRSUTUS (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, p. 132. (*Pulex hirsutus.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 560.

Host: Cynomys ludovicianus.
Habitat: Colorado.

CERATOPHYLLUS HIRUNDINIS Curtis.

1831. Köhler, Uebers. d. Arb. u. Veränd. d. Schles. Gesellsch. f. vaterl. Kultur. p. 73. (*Pulex hirundinis.*) Host, "*Chilidon urbica.*"
1832. Curtis, Brit. Entom., IX, no. 417, fig.
1835. Guérin and Percheron, Genera des Ins., 5th livr. No. 7.
1844. Gervais, Hist. nat. d. Ins. Aptères, III, p. 374. (*Pulex hirundinis.*)
1856. Walker, Dipt. Brit., III, p. 5. (*Pulex hirundinis.*)
1858. Maitland, Herklots Bouwstoffen, p. 311. (*Pulex hirundinis.*)
1859. Bouillon, Ann. d. Soc. Ent. Belge. (*Pulex hirundinis.*)
1874. Ritsema, Regensb. Corresp., XXVII, p. 78.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 187.
1892. Theobald, An Account of British Flies, I, p. 31. (*Pulex hirundinis.*)
1900. Rothschild, Novitates Zoologicæ, VII, p. 542.

Host: Hirundo urbica.
Habitat: Europe.

CERATOPHYLLUS IDAHOENSIS Baker.

1903. Baker, see p. 413.

Host: Citellus columbianus.
Habitat: Moscow, Idaho.

CERATOPHYLLUS IGNOTUS (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, pp. 111 and 191. (*Pulex ignotus* and *Typhlopsylla americana.*)
1896. Osborn, Div. Ent. Dept. Agrcl., Bull. V (n. s.), p. 154, figs. 86, 87. (*Typhlopsylla americana.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 560.

Hosts: Geomys bursarius and *Thomomys talpoides.*
Habitat: Iowa, Colorado, and Idaho.

CERATOPHYLLUS KEENI Baker.

1896. Baker, Canad. Ent., p. 234. (*Pulex keeni.*) Host, "*Sitomys keeni.*"

Host: *Peromyscus keeni.*
Habitat: Queen Charlotte Islands.

CERATOPHYLLUS LABIATUS Baker.

1903. Baker, see p. 402.

Host: *Lynx canadensis.*
Habitat: Moscow, Idaho.

CERATOPHYLLUS LAGOMYS Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 567, pl. VIII, fig. 1. Host, "*Lagomys rutilus.*"

Host: *Ochotona rutilus.*
Habitat: Transcaspia.

CERATOPHYLLUS LEUCOPUS Baker.

1903. Baker, see p. 401.

Host: *Peromyscus leucopus.*
Habitat: Peterboro, New York.

CERATOPHYLLUS LUCIDUS Baker.

1903. Baker, see p. 410.

Host: *Sciurus fremonti.*
Habitat: Southern Colorado.

CERATOPHYLLUS MELIS Curtis.

1832. Curtis, Brit. Ent., IX, no. 417. Host, "*Meles taxus.*"
1844. Gervais, Hist. nat. d. Ins. Aptères, III, p. 371. (*Pulex melis.*)
1856. Walker, Insecta Brit., Diptera, III, p. 5. (*Pulex melis.*)
1857. Gurlt, Archiv. f. Naturgesch., XXIII, p. 280. (*Pulex melis.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 33. (*Trichopsylla melis.*)
1874. Ritsema, Regensb. Correspond., XXVIII, p. 79. (*Pulex melis.*)
1875. Ritsema, Tijdschr. voor Entomol., XVI, p. lxxiv. (*Trichopsylla melis.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 184. (*Pulex melis.*)
1880. Taschenberg, Die Flöhe, p. 73, pl. II, fig. 15 and pl. III, fig. 16. (*Pulex melis.*)
1895. Baker, Canad. Ent., XXVII, p. 132. (*Pulex melis.*)

Host: *Meles meles.*
Habitat: Europe.

CERATOPHYLLUS METALLESCENS (Kolenati) Baker.

1856. Kolenati, Parasiten d. Chiropteren, p. 33. (*Pulex metallescens.*) Host, "*Pteropus ægyptiaca.*"
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 30, pl. I, fig. 1. (*Pulex metallescens.*)

1874. RITSEMA, Regensb. Corresp., XXVIII, p. 77. (*Pulex metallescens.*)
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 184. (*Pulex metallescens.*)
1880. TASCHENBERG, Die Flöhe, p. 101. (*Pulex metallescens.*)

Host: *Rousettus aegyptiacus.*
Habitat: Egypt.

CERATOPHYLLUS MONTANUS (Baker) Wagner.

1895. BAKER, Canad. Ent., XXVII, p. 132. (*Pulex montanus.*)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 560.

Host: *Sciurus aberti.*
Habitat: Colorado.

CERATOPHYLLUS MULTISPINOSUS Baker.

1898. BAKER, Journ. N. Y. Ent. Soc., VI, p. 54. (*Pulex multispinosus.*) Host, "*Lepus sylvaticus.*"

Host: *Lepus floridanus mallurus.*
Habitat: North Carolina.

CERATOPHYLLUS MUSTELÆ Wagner.

1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 565, pl. VIII, fig. 2. Host, "*Putorius vulgaris.*"

Host: *Putorius nivalis.*
Habitat: Gouv. Lublin, Russia.

CERATOPHYLLUS OCULATUS Baker.

1903. BAKER, see p. 396.

Host: *Putorius vison.*
Habitat: Washington City.

CERATOPHYLLUS PENCILLIGER (Grube) Wagner.

1852. GRUBE, Middendorfs Sibirische Reise, II, Pt. 1, p. 500. (*Pulex pencilliger*, as to male only.)
1863. KOLENATI, Horæ Soc. Ent. Ross., II, p. 32, pl. 1, fig. 3. (*Trichopsylla pencilliger.*)
1874. RITSEMA, Regensb. Corresp., XXVIII, p. 79. (*Pulex pencilliger.*)
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 183. (*Pulex pencilliger.*)
1880. TASCHENBERG, Die Flöhe, p. 99. (*Pulex pencilliger.*)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 15, pl. VIII, fig. 6 (as to male only).

Host: *Putorius sibirica.*
Habitat: Siberia.

CERATOPHYLLUS PERPINNATUS Baker.

1903. BAKER, see p. 391.

Host: (?)
Habitat: Queen Charlotte Islands.

CERATOPHYLLUS PETIOLATUS Baker.

1903. Baker, see p. 415.

Host: *Lynx canadensis.*
Habitat: Moscow, Idaho.

CERATOPHYLLUS PINNATUS Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 573, pl. VIII, fig. 5.

Host: *Mus* sp.
Habitat: New Alexandria, Russia.

CERATOPHYLLUS PROXIMUS Baker.

1903. Baker, see p. 412.

Host: *Citellus* sp.
Habitat: Palm Springs, Arizona.

CERATOPHYLLUS PSEUDARCTOMYS Baker.

1903. Baker, see p. 399.

Host: *Arctomys monax.*
Habitat: Newport, Herkimer County, New York.

CERATOPHYLLUS SCIURORUM (Schrank) Curtis.

1804. Schrank, Fauna boica, III, p. 195. (*Pulex sciurorum.*)
1832. Curtis, Brit. Ent., IX, no. 407.
1835. Bouché, Nov. Act. Acad. Leop. Carol., XVII, p. 506. (*Pulex sciurorum.*)
1844. Gervais, Hist. nat. d. Ins. Aptères, III, p. 373. (*Pulex sciurorum.*)
1856. Walker, Insect. Brit., III, p. 3. (*Pulex sciurorum.*)
1858. Maitland, Herklots Bouwstoffen, p. 310. (*Pulex sciurorum.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 78. (*Pulex sciurorum.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 183. (*Pulex sciurorum.*)
1880. Taschenberg, Die Flöhe, p. 75. (*Pulex sciurorum.*)
1895. Baker, Canad. Ent., XXVII, p. 132. (*Pulex sciurorum.*)
1896. Osborn, Div. Ent. Dept. Agrcl., Bull. V (n. s.), p. 48. (*Pulex sciurorum.*)

Host: *Sciuris vulgaris.*
Habitat: Europe.

CERATOPHYLLUS SEXDENTATUS Baker.

1903. Baker, see p. 403.

Host: *Neotoma* sp.
Habitat: Boulder Creek, California.

CERATOPHYLLUS SILANTIEWII Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXVII, p. 574, pl. VIII, fig. 12.

Host: *Arctomys bobac.*
Habitat: Russia.

CERATOPHYLLUS STURNI (Gervais) Baker.

1844. Gervais, Hist. nat. des Ins. Aptères, III, p. 375. (*Pulex sturni.*)
1856. Walker, Dipt. Brit., III, p. 7. (*Pulex sturni.*)
1858. Maitland, Herklots Bouwstoffen, p. 311. (*Pulex sturni.*)
1892. Theobald, An Account of British Flies, p. 32. (*Pulex sturni.*)

Host: *Sturnus vulgaris.*
Habitat: Europe.

CERATOPHYLLUS STYLOSUS Baker.

1903. Baker, see p. 418. Host, "*Haplodon rufa.*"

Host: *Aplodontia rufa.*
Habitat: Astoria, Oregon.

CERATOPHYLLUS STYX Rothschild.

1832. Curtis, Brit. Entom., IX, No. 417. (*Ceratophyllus bifasciatus.*)
1844. Gervais, Hist. nat. d. Ins. Aptères., III, p. 575. (*Ceratophyllus bifasciatus.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 76. (*Ceratophyllus bifasciatus.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Ceratophyllus bifasciatus.*)
1900. Rothschild, Novitates Zoologicæ, VII, p. 543, pl. IX, figs. 5, 7, 8, 16. (*Ceratophyllus styx.*)

Host: *Riparia riparia.*
Habitat: Europe.

CERATOPHYLLUS SUBARMATUS Wagner.

1900. Wagner, Horæ Soc. Ent. Ross., XXXV, p. 18. Host, "*Lagomys* sp."

Host: *Ochotona* sp.
Habitat: Alpine region of Altai Mountains, Russia.

CERATOPHYLLUS TESQUORUM Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 564, pl. VIII, fig. 9. Hosts, "*Spermophilus musicus* and *S. guttatus.*"

Hosts: *Citellus musicus* and *C. guttatus.*
Habitat: Russia and Siberia.

CERATOPHYLLUS TOLLII Wagner.

1900. Wagner, Horæ Soc. Ent. Ross., XXXV, p. 19, pl. I, fig. 8. Host, "*Pteromys volans.*"

Host: *Sciuropterus russicus.*
Habitat: Siberia.

CERATOPHYLLUS TUBERCULATUS Baker.

1903. Baker, see p. 393.

Host: *Citellus columbianus.*
Habitat: Moscow, Idaho.

CERATOPHYLLUS URALENSIS Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 571, pl. VIII, fig. 3.

Host: (?).

Habitat: Ural Mountains, Russia.

CERATOPHYLLUS VISON Baker.

1903. See p. 408.

Host: Putorius vison.

Habitat: Peterboro, New York.

CERATOPHYLLUS WAGNERI Baker.

1903. See p. 405.

Host: Peromyscus sp.

Habitat: Moscow, Idaho.

CERATOPHYLLUS WICKHAMI (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, p. 111. (*Pulex wickhami*, Host, "*Sciuropterus volans*," *P. gillettei*, Host, "*Sciurus canadensis*," and *P. howardii*, Hosts, "Red squirrel, Gray or Fox squirrel, and Field mouse.")

1896. Osborn, Div. Ent. Dept. Agrcl., Bull. V, p. 140, fig. 81. (*Pulex wickhami*, *P. gillettei*, and *P. howardii*.)

1898. Baker, Journ. N. Y. Ent. Soc., VI, 54. (*Pulex gillettei* and *P. howardii*.)

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 560.

Hosts: Sciuropterus volans, *Sciurus hudsonicus*, *Sciurus carolinensis*, *Arctomys monax*, and field mouse.

Habitat: New York, Michigan, Iowa, Nebraska, Georgia, Arizona.

Genus CTENOPHTHALMUS Kolenati.

CTENOPHTHALMUS AGYRTES (Heller) Baker.

1891. Saunders, Ent. Mo. Mag., II (2), p. 170. (*Typhlopsylla assimilis*, not of Taschenberg.)

1896. Heller, Entom. Nachrichten, XXII, p. 97. (*Typhlopsylla agyrtes.*)

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 35, pl. IX, figs. 23–24. (*Typhlopsylla agyrtes.*)

1898. Rothschild, Novitates Zoologicæ, V, p. 533, pl. XV, figs. 1–2; pl. XVII, figs. 12, 14, and 17–25. (*Typhlopsylla agyrtes.*) Hosts, "*Hypudæus glareolus*, *Mus sylvaticus*, *Arvicola amphibius*, *Sorex vulgaris*, *Crossopus ciliatus*, *T. alpa europæa.*"

Hosts: Erotomys hercynicus, *Mus sylvaticus*, *Microtus amphibius*, *Sorex araneus*, *Neomys fodiens*, and *Talpa europæa.*

Habitat: Europe.

CTENOPHTHALMUS ALTAICA (Wagner) Baker.

1900. Wagner, Horæ Soc. Ent. Ross., XXXV, p. 11, pl. I, fig. 5. (*Typhlopsylla altaica.*) Host, "*Lagomys* sp."

Host: Ochotona sp.

Habitat: Altai Mountains.

CTENOPHTHALMUS ASSIMILIS (Taschenberg) Baker.

1880. TASCHENBERG, Die Flöhe, p. 95, pl. IV, fig. 27. (*Typhlopsylla assimilis.*) Hosts, *Sorex vulgaris*, *Talpa europæa*, *Mus sylvaticus*, and *Arvicola arvalis.*
1895. BAKER, Canad. Ent., XXVII, p. 190. (*Typhlopsylla assimilis*, excluding American forms.)
1896. OSBORN, Div. Ent. Dept. Agrel., Bull. V (n. s.), p. 153. (*Typhlopsylla assimilis*, as to European forms.)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 34, pl. IX, fig. 25. (*Typhlopsylla assimilis.*)
1900. WAGNER, Horæ Soc. Ent. Ross., XXXV, p. 9. (*Typhlopsylla assimilis.*)

Hosts: *Sorex araneus*, *Talpa europæa*, *Mus sylvaticus*, and *Microtus arvalis.*
Habitat: Europe.

CTENOPHTHALMUS BIDENTATIFORMIS (Wagner) Baker.

1889. WAGNER, Horæ Soc. Ent. Ross., XXIII, p. 351, pl. VI, figs. 4, 5. (*Typhlopsylla bidentatiformis.*) Host, "*Mus decumanus.*"
1898. BAKER, Journ. N. Y. Ent. Soc., VI, p. 55. (*Typhlopsylla bidentatiformis.*)

Host: *Mus norvegicus.*
Habitat: Siberia.

CTENOPHTHALMUS BISOCTODENTATUS Kolenati.

1835. BOUCHÉ, Nov. Act. Acad. Leop. Carol., XVII, p. 507. *Pulex talpæ*, not Curtis.)
1857. KOLENATI, Paras. d. Chirop., p. 33. (*Ctenophthalmus talpæ.*)
1858. MAITLAND, Herklots Bouwstoffen, II, p. 310. (*Pulex talpæ*, not Curtis.)
1859. KOLENATI, Fauna des Altvaters, p. 65. (*Ctenophthalmus bisbidentatus*, syn. fide Kolenati.)
1863. KOLENATI, Horæ Soc. Ent. Ross., II, p. 35. (*Ctenophthalmus bisoctodentatus.*)
1873. RITSEMA, Tijds. v. Entomol., 2d ser., p. lxxxiv. (*Ctenophthalmus bisoctodentatus.*)
1874. RITSEMA, Regensb. Correspondenzblatt, XXVIII, p. 77. (*Ctenophthalmus bisoctodentatus.*)
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 184. (*Ctenophthalmus bisoctodentatus.*)
1900. WAGNER, Horæ Soc. Ent. Ross., XXXV, p. 8, pl. I, fig. 2. (*Typhlopsylla bisoctodentata.*)

Host: *Talpa europæa.*
Habitat: Europe.

CTENOPHTHALMUS DASYCNEMUS (Rothschild) Baker.

1897. ROTHSCHILD, The Ent. Record and Journ. of Variation, IX, No. 7, pl. (*Tryphlopsylla dasycnemus.*) Hosts, "*Sorex vulgaris* and *Talpa europæa.*"
1898. ROTHSCHILD, Novitates Zool., V, p. 540, pl. XV, figs. 4, 5. (*Typhlopsylla dasycnemus.*)

Hosts: *Sorex araneus* and *Talpa europæa.*
Habitat: England.

CTENOPHTHALMUS FRATERNUS Baker.

1895. Baker, Canad. Ent., XXVII, p. 190. (*Typhlopsylla fraterna.*)

Host: (?)
Habitat: South Dakota.

CTENOPHTHALMUS GENALIS Baker.

1903. See p. 424.

Host: *Scalops* sp.
Habitat: Michigan.

CTENOPHTHALMUS GIGAS (Kirby) Baker.

1837. Kirby, in Richardson's Fauna Boreali-Amer., IV, p. 318, pl. VI, fig. 9. (*Pulex gigas.*)
1840. Westwood, Introd. to Mod. Classif. of Ins., II, p. 493. (*Pulex gigas.*)
1843. Denny, Ann. and Mag. Nat. Hist., XII, p. 316. (*Pulex gigas.*)
1844. Gervais, Hist. Nat. d'Ins. Aptères., III, p. 374. (*Pulex gigas.*)
1874. Ritsema, Regensb. Correspondenzblatt, XXVIII, p. 78. (*Pulex gigas.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 180. (*Pulex gigas.*)
1880. Taschenberg, Die Flöhe, p. 98. (*Pulex gigas.*)
1895. Baker, Canad. Ent., XXVII, p. 164. (*Pulex gigas.*) Host, "*Lepus sylvaticus.*"
1896. Osborn, Div. Ent. Dept. Agricl., Bull. V (n. s.), p. 152. (*Pulex gigas.*)

Host: *Lepus floridanus* subsp.
Habitat: Canada and Michigan.

CTENOPHTHALMUS INGENS (Rothschild) Baker.

1900. Rothschild, The Entom. Record. and Journ. of Variation, XII, No. 2. (*Typhlopsylla ingens.*)

Host: *Bathyergus maritimus.*
Habitat: Cape Colony.

CTENOPHTHALMUS INTERMEDIUS (Wagner) Baker.

1900. Wagner, Horae Soc. Ent. Ross., XXXV, p. 8, pl. I, fig. 9. (*Typhlopsylla intermedia.*)

Host: *Metachirus opossum.*
Habitat: Paraguay and Ecuador.

CTENOPHTHALMUS ORIENTALIS (Wagner) Baker.

1898. Wagner, Horae Soc. Ent. Ross., XXXI, p. 37, pl. X, fig. 30. (*Typhlopsylla orientalis.*) Host, "*Spermophilus* sp."

Host: *Citellus* sp.
Habitat: Gouv. Charkow, Russia.

CTENOPHTHALMUS PENTACANTHUS (Rothschild) Baker.

1897. Rothschild, The Ent. Record and Journ. of Variation, IX, No. 3. (*Typhlopsylla pentacanthus.*

1898. ROTHSCHILD, Novitates Zoologicæ, V, p. 541, pl. XV, fig. 3. (*Typhlopsylla pentacanthus.*)

Host: *Mus sylvaticus*, *Talpa europæa.*
Habitat: England.

CTENOPHTHALMUS PSEUDAGYRTES Baker.

1895. BAKER, Canad. Ent., XXVII, p. 190 (*Typhlopsylla assimilis*)—not of Taschberg. Host, *Scalops* "*argentatus.*"
1898. BAKER, Journ. N. Y. Ent. Soc., (*Typhlopsylla assimilis* var.?)
1903. BAKER, see p. 421.

Hosts: *Scalops argentatus.*
Habitat: Iowa and Michigan.

CTENOPHTHALMUS SETOSA (Wagner) Baker.

1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 37, pl. X, fig. 78. (*Typhlopsylla setosa.*) Host, "*Spermophilus* sp."

Host: *Citellus* sp.
Habitat: Southeastern Russia.

CTENOPHTHALMUS SIBIRICA (Wagner) Baker.

1900. WAGNER, Horæ Soc. Ent. Ross., XXXV, p. 10. (*Typhlopsylla sibirica.*)

Host: *Spalax* sp.?
Habitat: Transbaikalia.

CTENOPHTHALMUS TRISTIS (Rothschild) Baker.

1900. ROTHSCHILD, The Entom. Record and Journ. of Variation, XII, no. 2, fig. 1. (*Typhlopsylla tristis.*)

Host: *Petaurus australis.*
Habitat: Victoria, Australia.

CTENOPHTHALMUS TYPHLUS (Motschulsky) Baker.

1840. MOTSCHULSKY, Bull. Soc. imp. Moscow, p. 169, fig. (*Pulex typhlus.*)
1874. RITSEMA, Regensb. Corresp., XXVIII, p. 79. (*Pulex typhlus.*)
1880. RITSEMA, Zeitschr. f. ges Naturwiss., LIII, p. 183. (*Pulex typhlus.*)
1880. TASCHENBERG, Die Flöhe, p. 94. (*Typhlopsylla caucasica.*)
1895. BAKER, Canad. Ent., XXVII, p. 190. (*Typhlopsylla caucasica.*)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 35. (*Typhlopsylla caucasica.*)

Host: *Spalax* sp.
Habitat: Caucasian steppes.

CTENOPHTHALMUS UNCINATA (Wagner) Baker.

1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 590, pl. X, fig. 29. (*Typhlopsylla uncinata.*) Host, "*Putorius vulgaris.*"

Host: *Putorius nivalis.*
Habitat: Gouv. Lublin, Russia.

Genus ANOMIOPSYLLUS Baker.

ANOMIOPSYLLUS NUDATUS Baker.

1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 56. (*Typhlopsylla nudata.*)

Host: *Neotoma albigula.*
Habitat: Arizona.

Genus CTENOPSYLLUS Kolenati.

CTENOPSYLLUS ALPINUS (Baker) Wagner.

1895. Baker, Canad. Ent., XXVII, p. 100. (*Typhlopsylla alpina.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 577.

Host: *Neotoma* sp.
Habitat: Colorado.

CTENOPSYLLUS BIDENTATUS (Kolenati) Wagner.

1860. Kolenati, Monog. der Europ. Chirop., p. 147. (*Ctenophthalmus bidentatus.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 38.
1893. Wagner, Horæ Soc. Ent. Ross., XXVII, p. 351.

Host: (?)
Habitat: Europe.

CTENOPSYLLUS GRACILIS (Taschenberg) Baker.

1880. Taschenberg, Die Flöhe, p. 96. (*Typhlopsylla gracilis*, exc. syn.) Hosts, "*Talpa europæa* and *Sorex vulgaris.*"
1895. Baker, Canad. Ent., XXVII, p. 190. (*Typhlopsylla gracilis.*)

Hosts: *Talpa europæa* and *Sorex araneus.*
Habitat: Europe.

CTENOPSYLLUS HESPEROMYS Baker.

1903. Baker. See p. 428.

Host: *Peromyscus* sp.
Habitat: Franconia, New Hampshire.

CTENOPSYLLUS MEXICANUS Baker.

1896. Baker, Canad. Ent., XXVIII, p. 85. (*Typhlopsylla mexicana.*)

Host: *Mus rattus.*
Habitat: Mexico.

CTENOPSYLLUS MUSCULI (Duges) Wagner.

1832. Duges, Ann. d. Sci. Nat., XXVIII, p. 163. (*Pulex musculi.*)
1835. Bouché, Nov. Act. Acad. Leop. Carol., XVII, p. 208. (*Pulex musculi.*)
1844. Gervais, Hist. Nat. d. Ins. Aptères, III, p. 374. (*Pulex musculi.*)
1856. Walker, Insect. Brit., Diptera, III, p. 4. (*Pulex musculi.*)
1856. Kolenati, Parasiten d. Chirop., p. 33. (*Ctenophthalmus musculi.*)
1859. Kolenati, Fauna d. Alvaters, p. 65. (*Ctenophthalmus quadridentatus.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 37. (*Ctenopsyllus quadridentatus.*)

1873. Kolenati, Tijds. v. Entomol., LXXXV. (*Ctenopsyllus quadridentatus.*)
1874. Ritsema, Regensb. Corresp., XXVIII, p. 78. (*Pulex musculi.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Pulex musculi.*)
1880. Taschenberg, Die Flöhe, p. 92, pl. IV, fig. 25. (*Typhlopsylla musculi.*) Hosts, "*Mus musculus, M. agrarius, M. decumanus,* and *M. rattus.*"
1895. Baker, Canad. Ent., XXVII, p. 190. (*Typhlopsylla musculi.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 577.

Host: *Mus musculus, M. agrarius, M. norvegicus,* and *M. rattus.*
Habitat: Europe.

CTENOPSYLLUS PECTINICEPS Wagner.

1893. Wagner, Horæ Soc. Ent. Ross., XXVII, p. 347, pl. VI, figs. 2–3. (*Typhlopsylla pectiniceps*). Host, "*Arvicola œconomus.*"
1898. Baker, Journ. N. Y. Ent. Soc., VI, p. 55. (*Typhlopsylla pectiniceps.*)

Host: *Microtus œconomus.*
Habitat: Transbaikalia.

CTENOPSYLLUS SIBIRICUS Wagner.

1852. Grube, Middendorf's Sibirische Reise, II, Pt. 1, p. 500. (*Pulex penicilliger* as to female only.)
1898. Wagner, Horæ Soc. Ent. Ross, XXXI, p. 24, pl. VIII, figs. 13–14. Hosts, "*Putorius sibiricus* and *P. vulgaris.*"

Hosts: *Putorius sibiricus* and *P. nivalis.*

CTENOPSYLLUS SILVATICUS (Meinert) Baker.

1896. Meinert, Entom. Meddels. 5 Bd. (*Typhlopsylla silvatica.*)

Host: (?)
Habitat: Europe.

CTENOPSYLLUS SPECTABILIS (Rothschild) Baker.

1898. Rothschild, The Entom. Record and Journ. of Variation, X, no. 10, fig. (*Typhlopsylla spectabilis.*) Host, "*Hypudæus glareolus.*"

Host: *Evotomys hercynicus brittanicus.*
Habitat: England.

CTENOPSYLLUS TASCHENBERGI Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 577.

Host: *Mus musculus.*
Habitat: Russia.

Genus STEPHANOCIRCUS Skuse.

STEPHANOCIRCUS DASYURI Skuse.

1890. Skuse, Records of Australian Museum, II, p. 77, Sydney, Sept.
1895. Baker, Canad. Ent., XXVII, p. 63.

Host: *Dasyurus maculatus.*
Habitat: New South Wales.

STEPHANOCIRCUS MARS Rothschild.

1898. Rothschild, Novitates Zoologicæ, V, p. 544, pl. xvi, fig. 11.

Host: "*Hesperomys*" sp.
Habitat: Argentina.

Genus HYSTRICHOPSYLLA Taschenberg.

HYSTRICHOPSYLLA AMERICANA Baker.

1899. Baker, Ent. News, Feb., p. 37. Host, "*Evotomys* sp."

Host: Evotomys gapperi.
Habitat: Maine.

HYSTRICHOPSYLLA TALPÆ (Curtis) Rothschild.

1826. Curtis, Brit. Ent., III, no. 114, fig. (*Pulex talpæ.*)
1844. Gervais, Hist. Nat. d. Ins. Aptères, III, p. 373. (*Pulex talpæ.*)
1856. Walker, Ins. Brit., Diptera, III, p. 4. (*Pulex talpæ.*)
1858. Bouillon, Ann. d. la Soc. Ent. Belge., II, p. 187. (*Pulex talpæ.*)
1868. Ritsema, Tijdschrift voor Entomol., 2 ser., III, p. 173. (*Pulex talpæ.*)
1873. Ritsema, Tijds. voor Entomol., p. lxxxiv. (*Pulex talpæ.*)
1874. Ritsema, Regenst. Corresp., XXVII, p. 76. (*Pulex talpæ.*)
1878. Ritsema, Tijds. voor Entomol., XVII, p. lxxiii. (*Pulex talpæ.*)
1880. Ritsema, Zeitschr. f. ges Naturwiss., LIII, p. 182. (*Pulex talpæ.*)
1880. Taschenberg, Die Flöhe, p. 83, pl. iii, fig. 21. (*Hystrichopsylla obtusiceps.*)
1895. Baker, Canad. Ent., XXVII, p. 186. (*Hystrichopsylla obtusiceps.*)
1900. Rothschild, The Entom. Record and Journ. of Variation, XII, no. 11, p. 257, pl. x. Hosts, "*Talpa europæa, Sorex vulgaris, Crossopus ciliatus, Mus sylvaticus, Hypudæus glareolus, Mustela vulgaris, Mustela erminea.*"

Hosts: Talpa europæa, Sorex araneus, Neomys fodiens, Mus sylvaticus, Evotomys hercynicus, Putorius nivalis, and *Putorius erminea.*
Habitat: Europe.

Genus CERATOPSYLLUS Kolenati.

CERATOPSYLLUS DICTENUS Kolenati.

1856. Kolenati, Paras. d. Chiropt., p. 32.
1857. Kolenati, Wiener Ent. Monats., p. 66.
1860. Kolenati, Monogr. d. europ. Chiropt., p. 58.
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 43, fig. 13. Host, "*Vesperugo discolor.*"
1874. Ritsema, Regensb. Corresp., XXVIII, p. 79.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 184.
1880. Taschenberg, Die Flöhe, p. 91. (*Typhlopsylla dictenus.*)
1895. Baker, Canad. Ent., XXVII, p. 190. (*Typhlopsylla dictenus.*)

Host: Vespertilio murinus.
Habitat: Russia.

CERATOPSYLLUS ELONGATUS (Curtis) Rothschild.

1829. Curtis, Guide Gen., p. 36. (*Ceratophyllus elongatus.*) Host, "*Vesperugo noctula.*"
1844. Gervais, Hist. Nat. d. Ins. Aptères., III, p. 372. (*Pulex elongatus.*)
1832. Curtis, Brit. Entom., IX, No. 417, fig. (*Ceratophyllus elongatus.*)

1874. RITSEMA, Regensb. Corresp., XXVIII, p. 78. (*Ceratophyllus elongatus.*)
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 182. (*Ceratophyllus elongatus.*)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 32, pl. IX, fig. 5. (*Ceratopsylla subobscura.*)
1898. ROTHSCHILD, Novitates Zool., V, p. 542, pl. XVI, figs. 6, 8, 10.

Host: *Pterygistes noctula.*
Habitat: Europe.

CERATOPSYLLUS HEXACTENUS Kolenati.

1856. KOLENATI, Paras. d. Chiropt., p. 51.
1857. KOLENATI, Wiener Ent. Monats., I, p. 66.
1860. KOLENATI, Monog. d. europ. Chiropt., pp. 122, 131, 138, and 142.
1863. KOLENATI, Horæ Soc. Ent. Ross., II, p. 41, fig. 11. Hosts, "*Plecotus auritus, Vesperugo discolor, Rhinolophus hipposideros, Synotus barbastellus, Vespertilio murinus, Vespertilio capacinii.*"
1873. RITSEMA, Tijds. v. Entomol., p. lxxxv.
1874. RITSEMA, Regensb. Corresp., XXVIII, p. 79.
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 184.
1880. TASCHENBERG, Die Flöhe, p. 89. (*Typhlopsylla hexactena.*)
1895. BAKER, Canad. Ent., XXVII, p. 189. (*Typhlopsylla hexactenus.*)
1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 31, pl. IX, fig. 19.

Hosts: *Plecotus auritus*, *Vespertilio murinus*, *Rhinolophus hipposideros*, *Barbastella barbastellus*, *Myotis myotis*, and *Myotis capacinii.*
Habitat: Europe.

CERATOPSYLLUS INCERTUS Rothschild.

1900. ROTHSCHILD, The Entom. Record and Journ. of Variation, XII. No. 2.

Hosts: *Nyctinomus jugularis* and *N. brachypterus.*
Habitat: Madagascar and Sierra Leone.

CERATOPSYLLUS INTERMEDIUS Rothschild.

1898. ROTHSCHILD, Novitates Zoologicæ, V, p. 543, pl. XVII, fig. 15. Host, "*Vesperugo serotinus.*"

Host: *Vespertilio serotinus.*
Habitat: England.

CERATOPSYLLUS JUBATUS Wagner.

1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 30, pl. IX, figs. 20 and 22. Host, "*Vesperugo pipistrellus.*"
1898. ROTHSCHILD, Novitates Zoologicæ, V, p. 544.

Host: *Pipistrellus pipistrellus.*
Habitat: Europe.

CERATOPSYLLUS OBSCURUS Wagner.

1898. WAGNER, Horæ Soc. Ent. Ross., XXXI, p. 30. Host, "*Vesperugo discolor.*"

Host: *Vespertilio murinus.*
Habitat: Russia.

CERATOPSYLLUS OCTACTENUS Kolenati.

1856. Kolenati, Paras. d. Chiropt., p. 31, pl. III, fig. 31.
1857. Kolenati, Wiener Ent. Monats., I, p. 66.
1858. Kolenati, Fauna d. Altvaters, p. 65.
1860. Kolenati, Monogr. d. europ. Chiropt., pp. 51, 55, 58, 66, 77, 86, 91, 95, 115, 122, 131, and 148.
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 42, fig. 12. Hosts, "*Synotus barbastellus, Plecotus auritus, Rhinolophus hipposideros, Amblyotus atratus, Vesperugo pipistrellus, Vesperugo serotinus, Vesperugo noctula, Vesperugo discolor, Vesperugo nilssonii, Vespertilio nattereri, Vespertilio murinus, Vespertilio ciliatus,* and *Vespertilio mystacinus.*"
1873. Ritsema, Tijds. v. Entomol., p. lxxxv.
1874. Ritsema, Regensb. Corresp., XXVIII, p. 79.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 184.
1880. Taschenberg, Die Flöhe, p. 87, pl. IV, fig. 22. (*Typhlopsylla octactenus.*)
1895. Baker, Canad. Ent., XXVII, p. 189. (*Typhlopsylla octactenus.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 26, pl. IX, fig. 16.
1898. Rothschild, Novitates Zoologicæ, V, p. 543, pl. XVI, figs. 7 and 9.

Hosts: *Barbastella barbastellus*, *Plecotus auritus*, *Rhinolophus hipposideros*, *Amblyotus atratus*, *Pipistrellus pipistrellus*, *Vespertilio serotinus*, *Pterygistes noctula*, *Vespertilio murinus*, *Vespertilio nilssonii*, *Myotis nattereri*, *Myotis myotis*, *Myotis ciliatus*, and *Myotis mystacinus*.

Habitat: Europe.

CERATOPSYLLUS PENTACTENUS Kolenati.

1856. Kolenati, Paras. d. Chiropt., p. 32. (*Ceratopsyllus pentactenus* and *C. tetractenus.*)
1857. Kolenati, Wiener Ent. Monats., I, p. 66. (*Ceratopsyllus tetractenus.*)
1860. Kolenati, Monogr. d. europ. Chiropt., pp. 58, 86, 122, 131, and 138. (*Ceratopsyllus tetractenus.*)
1863. Kolenati, Horæ Soc. Ent. Ross., II, p. 39. (*Ceratopsyllus tetractenus.*) Hosts, *Plecotus auritus, Synotus barbastellus, Vesperugo pipistrellus, Vesperugo noctula, Vesperugo discolor,* and *Vespertilio murinus.*
1873. Ritsema, Tijds. v. Entom., p. lxxxv. (*Ceratopsyllus tetractenus.*)
1874. Ritsema, Regensb. Corresp., p. 80. (*Ceratopsyllus tetractenus.*)
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 185. (*Ceratopsyllus tetractenus.*)
1880. Taschenberg, Die Flöhe, p. 90, pl. IV, fig. 24. (*Typhlopsylla pentactenus.*)
1892. Saunders, Ent. Mo. Mag., (2), III, p. 66.
1895. Baker, Canad. Ent., XXVII, p. 189. (*Typhlopsylla pentactenus.*)
1895. Rothschild, Novitates Zool., II, p. 66.

Hosts: *Plecotus auritus*, *Barbastella barbastellus*, *Pipistrellus pipistrellus*, *Pterygistes noctula*, *Vespertilio murinus*, and *Myotis myotis*.

Habitat: Europe.

CERATOPSYLLUS PETROPOLITANUS (Wagner) Baker.

1898. Wagner, Horae Soc. Ent. Ross., XXXI, pl. IX, fig. 18. (*Ceratopsylla hexactena* var. *petropolitana.*)

Host: A bat.

Habitat: Russia.

CERATOPSYLLUS UNIPECTINATUS (Taschenberg) Wagner.

1880. Taschenberg, Die Flöhe, p. 91. (*Typhlopsylla unipectinata.*)
1895. Baker, Canad. Ent., XXVII, p. 189. (*Typhlopsylla unipectinata.*)
1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 580.

Host: Rhinolophus hipposideros.
Habitat: Europe.

CERATOPSYLLUS VARIABILIS Wagner.

1898. Wagner, Horæ Soc. Ent. Ross., XXXI, p. 28, pl. IX, fig. 16. Host, "*Vespertugo nathusii.*"

Host: Pipistrellus abramus.
Habitat: Russia.

HOST INDEX.

Class AVES.

Aegithalos roseus ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Chloris chloris ..... *Ceratophyllus fringillæ* (Walker) Baker.
Columba livia ..... *Ceratophyllus columbæ* (Walckener and Gervais) Rothschild.
Columba oenas ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Erithacus rubecula ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Gallus domesticus ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Nestopsylla gallinacea (Westwood) Baker.
Hirundo urbica ..... *Ceratophyllus hirundinis* Curtis.
Megascops asio ..... *Ceratophyllus asio* Baker.
Meleagris gallipavo ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Nestopsylla gallinacea (Westwood) Baker.
Merula merula ..... *Ceratophyllus gallinæ* (Schrank) Wagner.
Passer domesticus ..... *Ceratophyllus fringillæ* (Walker) Baker.
Pelecanoides urinatrix ..... *Pulex kerguelensis* Taschenberg.
Psittacus sp ..... *Hectopsylla psittaci* Frauenfeld.
Riparia riparia ..... *Ceratophyllus styx* Rothschild.
Sturnus vulgaris ..... *Ceratophyllus sturni* (Gervais) Baker.

Class MAMMALIA.

Order MONOTREMATA.

Tachyglossus aculeatus ..... *Echidnophaga ambulans* Olliff.
Pulex echidnæ Denny.

Order MARSUPALIA.

Dasyurus maculatus ..... *Stephanocircus dasyuri* Skuse.
Didelphis virginiana ..... *Pulex irritans* Linnæus, var. *simulans* Baker.
Metachirus opossum ..... *Ctenophthalmus intermedius* (Wagner) Baker.
Petaurus australis ..... *Ctenophthalmus tristis* (Rothschild) Baker.

Order EDENTATA.

Zaëdyus minutus ..... *Megapsylla grossiventris* (Weyenberg) Baker.

Order GLIRES.

Family LEPORIDÆ.

Lepus cuniculus	*Pulex leporis* (Leach) Baker.
Lepus floridanus sub sp.	*Ceratophyllus multispinosus* Baker.
	Pulex inaequalis Baker.
	Pulex simplex Baker.
Lepus "glacialis"	*Pulex glacialis* Taschenberg.
Lepus timidus	*Ctenocephalus canis* (Curtis) Baker.
	Pulex leporis (Leach) Baker.
Lepus sp	*Pulex affinis* Baker.

Family OCHOTONIDÆ (Lagomyidæ).

Ochotona rutilus	*Ceratophyllus lagomys* Wagner.
Ochotona sp.?	*Ceratophyllus subarmatus* Wagner.
	Ctenophthalmus altaica (Wagner) Baker.

Family DIPODIDÆ.

Alactaga jaculus	*Pulex jaculans* Motschulsky.

Family GEOMYIDÆ.

Geomys bursarius	*Ceratophyllus ignotus* (Baker) Wagner.
Thomomys talpoides	*Ceratophyllus ignotus* (Baker) Wagner.

Family SPALACIDÆ.

Bathyergus maritimus	*Ctenophthalmus ingens* (Rothschild) Baker.
Spalax sp	*Ctenophthalmus sibirica* (Wagner) Baker.
Spalax sp	*Ctenophthalmus typhlus* (Motschulsky) Baker.

Family MURIDÆ.

Cricetus cricetus	*Ceratophyllus fasciatus* (Bosc) Curtis.
Evotomys gapperi	*Hystrichopsylla americana* Baker.
Evotomys hercynicus	*Ctenophthalmus agyrtes* (Heller) Baker.
	Ctenopsyllus spectabilis (Rothschild) Baker.
	Hystrichopsylla talpæ (Curtis) Rothschild.
"Hesperomys" sp.	*Stephanocircus mars* Rothschild.
Lemmus sp.	*Pulex lemmus* Motschulsky.
Microtus amphibius	*Ctenophthalmus agyrtes* (Heller) Baker.
Microtus arvalis	*Ctenophthalmus assimilis* (Taschenberg) Baker.
	Hystrichopsylla talpæ (Curtis) Rothschild.
Microtus californicus	*Ceratophyllus californicus* Baker.
Microtus oeconomus	*Ctenopsyllus pectiniceps* Wagner.
Microtus sp	*Ceratophyllus consimilis* Wagner.
Mus agrarius	*Ctenopsyllus musculi* (Duges) Wagner.
Mus albipes	*Pulex pallidus* Taschenberg.
Mus musculus	*Ceratophyllus fasciatus* (Bosc) Curtis.
	Ctenopsyllus musculi (Duges) Wagner.
	Ctenopsyllus taschenbergi Wagner.
Mus norvegicus	*Ceratophyllus fasciatus* (Bosc) Curtis.
	Ctenophthalmus bidentatiformis (Wagner) Baker.
	Ctenopsyllus musculi (Duges) Wagner.
	Pulex brasiliensis Baker.

Mus rattus	*Ctenopsyllus mexicanus* Baker.
	Ctenopsyllus musculi (Duges) Wagner.
	Pulex brasiliensis Baker.
Mus sylvaticus	*Ceratophyllus gallinæ* (Schrank) Wagner.
	Ctenophthalmus agyrtes (Heller) Baker.
	Ctenophthalmus assimilis (Taschenberg) Baker.
	Ctenophthalmus pentacanthus (Rothschild) Baker.
	Ctenopsyllus musculi (Duges) Wagner.
	Hystrichopsylla talpæ (Curtis) Rothschild.
Neotoma albigula	*Anomiopsyllus nudatus* Baker.
Neotoma spp	*Ceratophyllus sexdentatus* Baker.
	Ctenopsyllus alpinus (Baker) Wagner.
Peromyscus eremicus	*Ceratophyllus eremicus* Baker.
Peromyscus leucopus	*Ceratophyllus leucopus* Baker.
Peromyscus keeni	*Ceratophyllus keeni* Baker.
Peromyscus sp	*Ceratophyllus wagneri* Baker.
Peromyscus sp	*Ctenopsyllus hesperomys* Baker.

Family MYOXIDÆ.

Eliomys quercinus	*Ceratophyllus fasciatus* (Bosc) Curtis.
Glis nitedula	*Ceratophyllus dryas* (Wagner) Baker.

Family APLODONTIIDÆ.

Aplodontia rufa	*Ceratophyllus stylosus* Baker.

Family SCIURIDÆ.

Arctomys bobac	*Ceratophyllus silantiewii* Wagner.
Arctomys monax	*Ceratophyllus arctomys* Baker.
	Ceratophyllus pseudarctomys Baker.
	Ceratophyllus wickhami (Baker) Wagner.
Citellus columbianus	*Ceratophyllus braueri* (Baker) Wagner.
	Ceratophyllus idahoensis Baker.
	Ceratophyllus tuberculatus Baker.
Citellus empetra	*Ceratophyllus alaskensis* Baker.
Citellus franklinii	*Ceratophyllus braueri* (Baker) Wagner.
Citellus guttatus	*Ceratophyllus tesquorum* Wagner.
Citellus macrourus	*Pulex dugesii* Baker.
Citellus musicus	*Ceratophyllus tesquorum* Wagner.
Citellus 13-lineatus	*Ceratophyllus braueri* (Baker) Wagner.
Citellus spp	*Ceratophyllus proximus* Baker.
	Ctenophthalmus orientalis (Wagner) Baker.
	Ctenophthalmus setosa (Wagner) Baker.
	Pulex anomalus Baker.
Cynomys ludovicianus	*Ceratophyllus hirsutus* (Baker) Wagner.
Eutamias sp	*Ceratophyllus ciliatus* Baker.
Sciuropterus russicus	*Ceratophyllus armatus* Wagner.
	Ceratophyllus tollii Wagner.
Sciuropterus volans	*Ceratophyllus wickhami* (Baker) Wagner.
Sciurus aberti	*Ceratophyllus montanus* (Baker) Wagner.
Sciurus carolinensis	*Ceratophyllus wickhami* (Baker) Wagner.

Sciurus fremonti	*Ceratophyllus coloradensis* (Baker) Wagner.
	Ceratophyllus divisus Baker.
	Ceratophyllus lucidus Baker.
Sciurus hudsonicus	*Ceratophyllus wickhami* (Baker) Wagner.
Sciurus vulgaris	*Ceratophyllus sciurorum* (Schrank) Curtis.

Order INSECTIVORA.

Family TENRECIDÆ.

Tenrec ecaudatus	*Pulex madagascariensis* Rothschild.

Family SORICIDÆ.

Crocidura aranea	*Ctenophthalmus assimilis* (Taschenberg) Baker.
	Ctenopsyllus gracilis (Taschenberg) Baker.
Neomys fodiens	*Ctenophthalmus agyrtes* (Heller) Baker.
	Hystrichopsylla talpæ (Curtis) Rothschild.
Sorex alpinus	*Ctenophthalmus assimilis* (Taschenberg) Baker.
	Ctenopsyllus gracilis (Taschenberg) Wagner.
Sorex araneus	*Ctenophthalmus agyrtes* (Heller) Baker.
	Ctenophthalmus assimilis (Taschenberg) Baker.
	Ctenophthalmus dasycnemus (Rothschild) Baker.
	Ctenopsyllus gracilis (Taschenberg) Wagner.
	Hystrichopsylla talpæ (Curtis) Rothschild.

Family TALPIDÆ.

Scalops argentatus	*Ctenophthalmus genalis* Baker.
	Ctenophthalmus pseudagyrtes Baker.
Talpa europæa	*Ctenophthalmus agyrtes* (Heller) Baker.
	Ctenophthalmus assimilis (Taschenberg) Baker.
	Ctenophthalmus bisoctodentatus Kolenati.
	Ctenophthalmus dasycnemus (Rothschild) Baker.
	Ctenophthalmus pentacanthus (Rothschild) Baker.
	Ctenopsyllus gracilis (Taschenberg) Baker.
	Ceratophyllus fasciatus (Bosc) Curtis.
	Hystrichopsylla talpæ (Curtis) Rothschild.

Family ERINACEIDÆ.

Erinaceus europæus	*Ctenocephalus erinacei* (Leach) Baker.
	Pulex cuspidatus Kolenati.
	Pulex longispinus Wagner.

Order CHIROPTERA.

Amblyotus atratus	*Ceratopsyllus octactenus* Kolenati.
Barbastella barbastellus	*Ceratopsyllus hexactenus* Kolenati.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
Myotis capacinii	*Ceratopsyllus hexactenus* Kolenati.
Myotis ciliatus	*Ceratopsyllus octactenus* Kolenati.
Myotis myotis	*Ceratopsyllus hexactenus* Kolenati.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
Myotis mystacinus	*Ceratopsyllus octactenus* Kolenati.
Myotis nattereri	*Ceratopsyllus octactenus* Kolenati.

Nyctinomus sp	*Hectopsylla psittaci* Frauenfeld.
Nyctinomus brachypterus	*Ceratopsyllus incertus* Rothschild.
Nyctinomus jugularis	*Ceratopsyllus incertus* Rothschild.
Pipistrellus abramus	*Ceratopsyllus variabilis* Wagner.
Pipistrellus pipistrellus	*Ceratopsyllus jubatus* Wagner.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
Plecotus auritus	*Ceratopsyllus hexactenus* Kolenati.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
Pterygistes noctula	*Ceratopsyllus elongatus* (Curtis) Rothschild.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
	Ceratopsyllus gallinæ (Schrank) Wagner.
Rhinolophus hipposideros	*Ceratopsyllus hexactenus* Kolenati.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus unipectinata Taschenberg.
Rousettus ægyptiacus	*Ceratophyllus metallescens* (Kolenati) Baker.
Vespertilio murinus	*Ceratopsyllus dictenus* Kolenati.
	Ceratopsyllus hexactenus Kolenati.
	Ceratopsyllus obscurus Wagner.
	Ceratopsyllus octactenus Kolenati.
	Ceratopsyllus pentactenus Kolenati.
Vespertilio nilssonii	*Ceratopsyllus octactenus* Kolenati.
Vespertilio serotinus	*Ceratopsyllus intermedius* Rothschild.
	Ceratopsyllus octactenus Kolenati.

Order UNGULATA.

Family SUIDÆ.

Sus scrofa	*Sarcopsylla penetrans* (Linnaeus) Westwood.

Family BOVIDÆ.

Bos taurus	*Sarcopsylla penetrans* (Linnaeus) Westwood.
	Vermipsylla alacurt Schrank.
	Xestopsylla gallinacea (Westwood) Baker.
Capra hircus	*Sarcopsylla penetrans* (Linnaeus) Westwood.
	Vermipsylla alacurt Schrank.
Ovis aries	*Sarcopsylla penetrans* (Linnaeus) Westwood.
	Vermipsylla alacurt Schrank.

Family EQUIDÆ.

Equus spp	*Sarcopsylla penetrans* (Linnæus) Westwood.
	Vermipsylla alacurt Schrank.
	Xestopsylla gallinacea (Linnæus) Baker.

Order FERÆ.

Family PROCYONIDÆ.

Procyon lotor	*Ctenocephalus canis* (Curtis) Baker.

Family URSIDÆ.

Ursus arctos	*Pulex tuberculaticeps* Bezzi.

Family MUSTELIDÆ.

Grison vittata	*Pulex lutzii* Baker.
Meles meles	*Ceratophyllus melis* Curtis.
	Pulex vulpes Motschulsky.
Putorius erminea	*Hystrichopsylla talpæ* (Curtis) Rothschild.
Putorius nivalis	*Ceratophyllus mustelæ* Wagner.
	Ctenophthalmus uncinata (Wagner) Baker.
	Ctenopsyllus sibiricus Wagner.
	Hystrichopsylla talpæ (Curtis) Rothschild.
Putorius sibirica	*Ceratophyllus pencilliger* (Grube) Wagner.
	Ctenopsyllus sibiricus Wagner.
Putorius vison	*Ceratophyllus oculatus* Baker.
	Ceratophyllus vison Baker.

Family VIVERRIDÆ.

Herpestes ichneumon	*Ctenocephalus canis* (Curtis) Baker.
	Pulex pallidus Taschenberg.

Family HYÆNIDÆ.

Hyæna striata	*Ctenocephalus canis* (Curtis) Baker.
	Pulex hyænæ Kolenati.

Family CANIDÆ.

Canis familiaris	*Ctenocephalus canis* (Curtis) Baker.
	Pulex irritans Linnæus.
	Sarcopsylla penetrans (Linnæus) Westwood.
	Xestopsylla gallinacea (Westwood) Baker.
Fennecus brucei	*Ctenocephalus canis* (Curtis) Baker.
Urocyon cinereoargenteus	*Ctenocephalus canis* (Curtis) Baker.
Vulpes lagopus	*Ctenocephalus canis* (Curtis) Baker.
Vulpes vulpes	*Ctenocephalus canis* (Curtis) Baker.
	Pulex vulpes Motschulsky.
Vulpes sp.	*Pulex irritans* Linnæus.

Family FELIDÆ.

Felis domestica	*Ctenocephalus canis* (Curtis) Baker.
	Pulex irritans Linnæus.
	Sarcopsylla penetrans (Linnæus) Westwood.
	Xestopsylla gallinacea (Westwood) Baker.
Felis leo	*Sarcopsylla penetrans* (Linnæus) Westwood.
Felis macroscelis	*Ctenocephalus canis* (Curtis) Baker.
Felis tigris	*Ctenocephalus canis* (Curtis) Baker.
Felis yaguaroundi	*Ctenocephalus canis* (Curtis) Baker.
Lynx canadensis	*Ceratophyllus dentatus* Baker.
	Ceratophyllus labiatus Baker.
	Ceratophyllus petiolatus Baker.
	Pulex lynx Baker.

Order PRIMATES.

Gorilla gorilla	*Sarcopsylla penetrans* (Linnæus) Westwood.
Homo sapiens	*Ctenocephalus canis* (Curtis) Baker.
	Pulex irritans Linnæus.
	Sarcopsylla penetrans (Linnæus) Westwood.
	Xestopsylla gallinacea (Westwood) Baker.

GEOGRAPHICAL DISTRIBUTION.

With our very incomplete knowledge of the group, any broad generalizations as to distribution must be considered as merely tentative. At this stage, however, the following observations may be of interest:

I. The Palæarctic and Nearctic regions each possess a genus not known to the other, the other genera being common to the two regions.

II. The order is very homogeneous north of the equator, very heterogeneous near to and south of it, South America furnishing the greatest number of isolated types.

III. Species peculiar to those regions have not yet been described from Central America, Polynesia, Japan, China, India, and South Africa. Unquestionably all of these regions will furnish many peculiar forms.

IV. One species has been described from Arctic regions and one from Antarctic regions.

V. The genus *Stephanocircus* is represented by two species—one Australian (on *Dasyurus*) and one South American (on "*Hesperomys*").

VI. The genus *Hystrichopsylla* contains two species—one from Europe, the other from northeast America.

VII. In America no species have been reported from the larger proportion of our native mammals, including bats, raccoon, badger, beaver, puma, muskrat, etc., though they all probably harbor fleas.

VIII. The following genera are distinctly local in distribution: *Vermipsylla*, *Echidnophaga*, *Stephanocircus*, *Megapsylla*, *Hectopsylla*, and *Anomiopsyllus*.

IX. In tropical regions four species are nearly cosmopolitan: *Pulex irritans*, *Ctenocephalus canis*, *Sarcopsylla penetrans*, and *Xestopsylla gallinacea*. The two former are also nearly cosmopolitan in temperate regions.

Statistics of families, genera, and species.

Described from—	Families.	Genera.	Species.
Europe and North Asia	2	8	65
Africa and South Asia	2	8	10
Eastern North America	2	7	17
Middle North America	2	7	25
Pacific North America	1	4	10
South America	3	8	10
Mexico	2	4	7
Australasia	1	3	6
Kerguelen Island	1	1	1
Listed by Taschenberg in 1880	2	3	33
Listed in present paper (1902)	1	14	135

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SPECIES INCERTÆ SEDIS.

CERATOPHYLLUS MURIS Curtis.

1832. CURTIS, British Entomology, IX, No. 417.
1874. RITSEMA, Regensb. Correspondenzblatt, XXVIII, p. 76.
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 182.

Questionably referred to *musculi* Duges by Taschenberg.

CTENOPHTHALMUS BISSEPTEMDENTATUS Kolenati.

1859. KOLENATI, Fauna d. Altvaters, p. C5 (*C. unidentatus*).
1863. KOLENATI, Horæ Soc. Ent. Ross., II, p. 36.
1873. RITSEMA, Tijdsch. v. Entomol., p. lxxxiv.
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1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 185.

Considered by Taschenberg as questionably equivalent to his *assimilis*.

PULEX AURITUS Fabricius.

1783. FABRICIUS, Nye Samling af der Kong. Danske Vet. Sels. Skrifter., p. 309, fig.
1874. RITSEMA, Regensb. Correspondenzblatt, XXVIII, p. 77.
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 181.

Described from *Picus viridis* in Sweden. Evidently one of the *avium* group.

PULEX BOLETI Guerin.

1836. GUERIN, Iconogr. du règne animal. Texte explicatif. Insectes, p. 14.

Presumably an insect of some other order.

PULEX MURIS Gervais.

1844. GERVAIS, Hist. nat. d. Ins. Aptères, III, 374.

Taschenberg questions the identity of this with *musculi* of Dugès.

PULEX SEGNIS Schönherr.

1816. SCHÖNHERR, Kon. Vet. Nya Handl., XXXII, p. 98, fig.
1874. RITSEMA, Regensb. Correspondenzblatt, XXVIII, p. 76.
1880. RITSEMA, Zeitschr. f. ges. Naturwiss., LIII, p. 182.

Taschenberg also thinks that this and *musculi* Duges may possibly be the same.

PULEX TERRESTRIS Macquart.

1831. Macquart, Ann. d. Scienc. Nat., XXII, p. 465.
1844. Gervais, Hist. Nat. d. Ins. Aptères, III, p. 375.
1874. Ritsema, Regensb. Correspondenzblatt, XXVIII, p. 76.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 182.

Listed by Taschenberg as a possible synonym of *Hystrichopsylla talpæ*.

PULEX VAGABUNDA Boheman.

1865. Boheman, Ofvers. of K. Vet. Akad. Förh., p. 576, fig.
1874. Ritsema, Regensb. Correspondenzblatt, XXVIII, p. 80.
1880. Ritsema, Zeitschr. f. ges. Naturwiss., LIII, p. 185.

Taschenberg considers this as questionably *fasciatus*.

PULEX VESPERTILIONIS Dugès.

1832. Dugès, Ann. d. Scienc. Nat., XXVII, p. 161, fig.

Considered by Taschenberg as questionably *octactenus* Kolenati.

PULEX VESPERTILIONIS Bouché.

1835. Bouché, Nov. Act. Acad. Leop. Carol., XVII, Pt. 1, p. 508.

Apparently not the same as last, and Taschenberg lists it as a possible synonym of *hexactenus* Kolenati.

APPENDIX.

Just as the foregoing paper is going to the printers I have, through the kindness of Mr. Rothschild, been enabled to examine his last two papers published during this year.

In the one entitled New British Fleas he describes *Ceratophyllus garei* from the water hen (*Gallinula chloropus*) and *Ceratophyllus walkeri* from *Putorius ermineu*, *P. nivalis*, *Sorex araneus*, *Evotomys hercynicus*, and *Microtus amphibius*.

The other paper, Some New Nearctic Fleas, is of more direct interest to us, in that three new American fleas are described.

Pulex ursi, from *Ursus horribilis*, in Alberta, Canada, is very interesting, in that it appears to be more closely related to *bohlsii* and *lutzii* than to any other North American species.

Typhlopsylla grandis, from *Tamias striatus*, in Ontario, is apparently a Ctenophthalmus, and closely related to *C. gigas*, from which it differs, among other things, in having two unequal genal spines.

Hystrichopsylla dippiei, from *Putorius longicaudus*, in Alberta, Canada, is apparently near the species already noted by me as being new. It differs from *H. americana* in having but six genal spines and thirty-six teeth in the pronotal ctenidium.

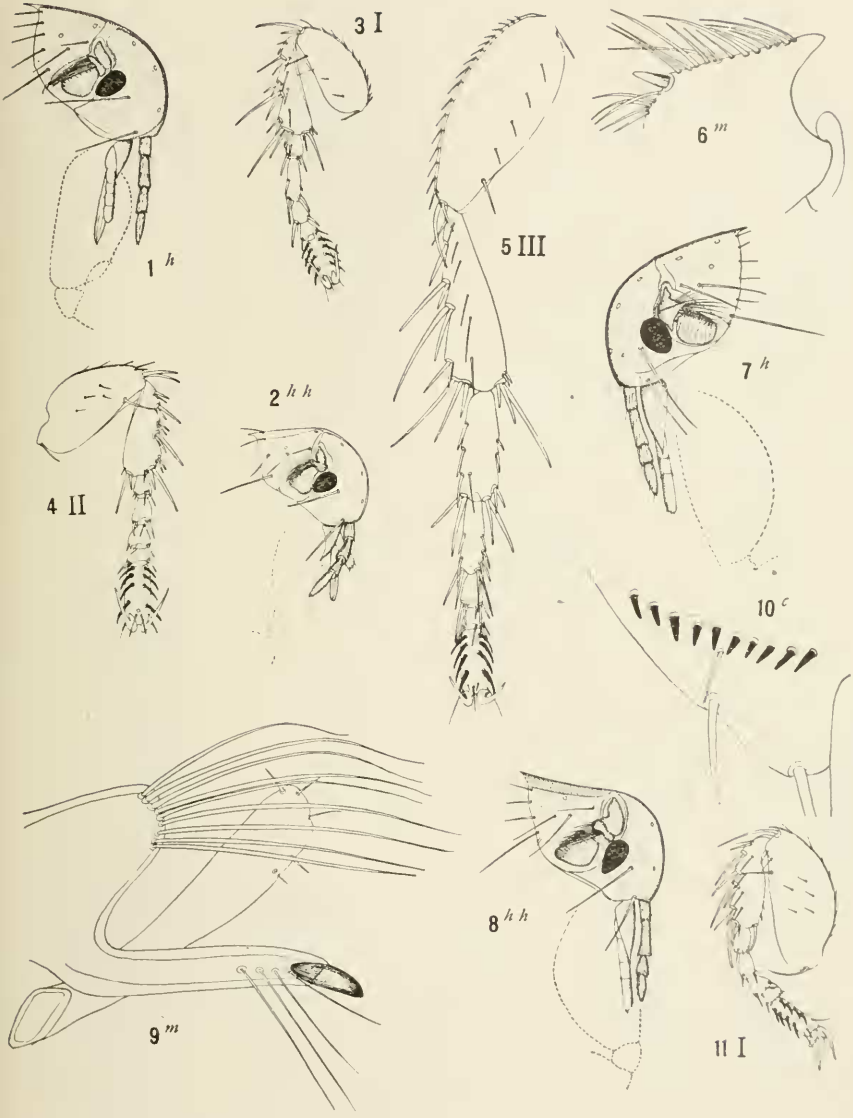
I regret not having been able to examine Mr. Enderlein's late paper, though I have made repeated endeavors to do so.

Stanford University, California, March 1, 1900.

EXPLANATION OF LETTERING ON PLATES.

h=head of female.
hh=head of male.
I=fore leg.
II=middle leg.
III=hind leg.
m=genital apparatus of male.
f=genital apparatus of female.
c=inner distal portion of hind coxa.
c=hind coxa.
t=hind tarsus.
d=dorsum of female.
dd=dorsum of male.

With but few exceptions all the figures were drawn to the same scale, and these exceptions will be apparent. For exact measurements refer to descriptions.



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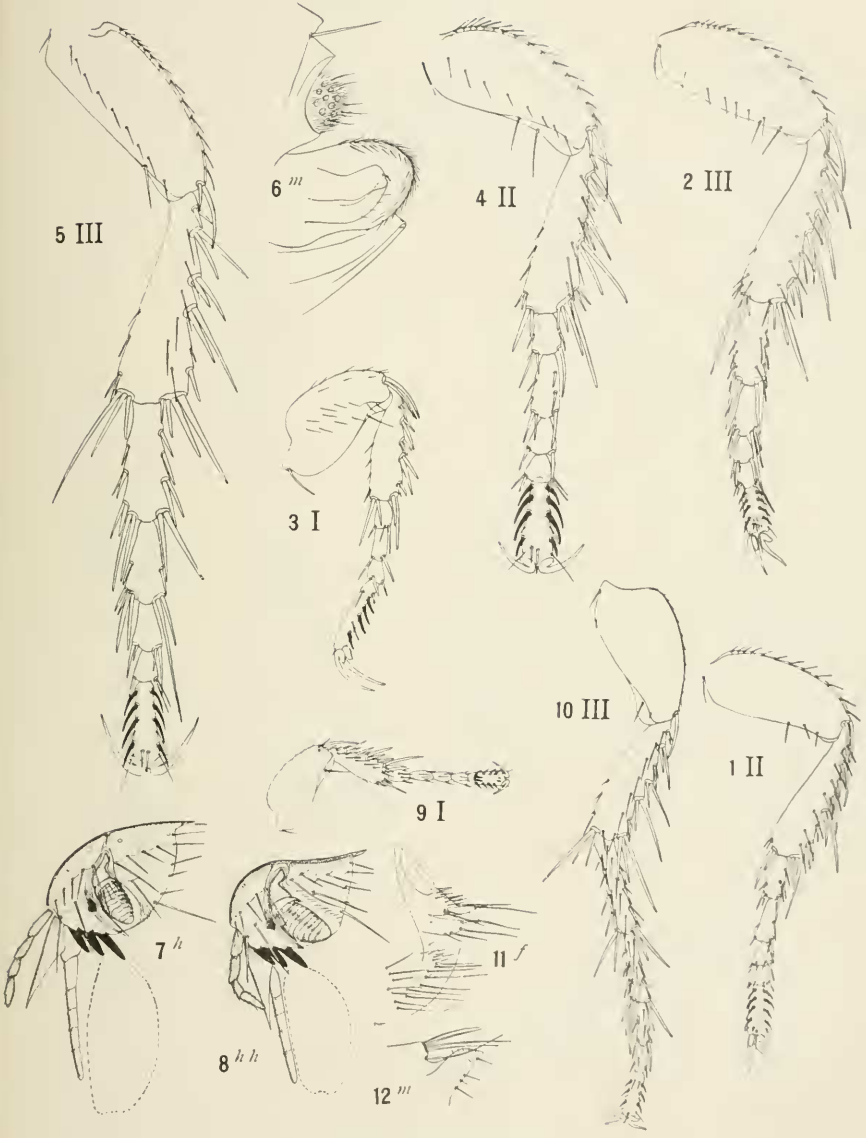

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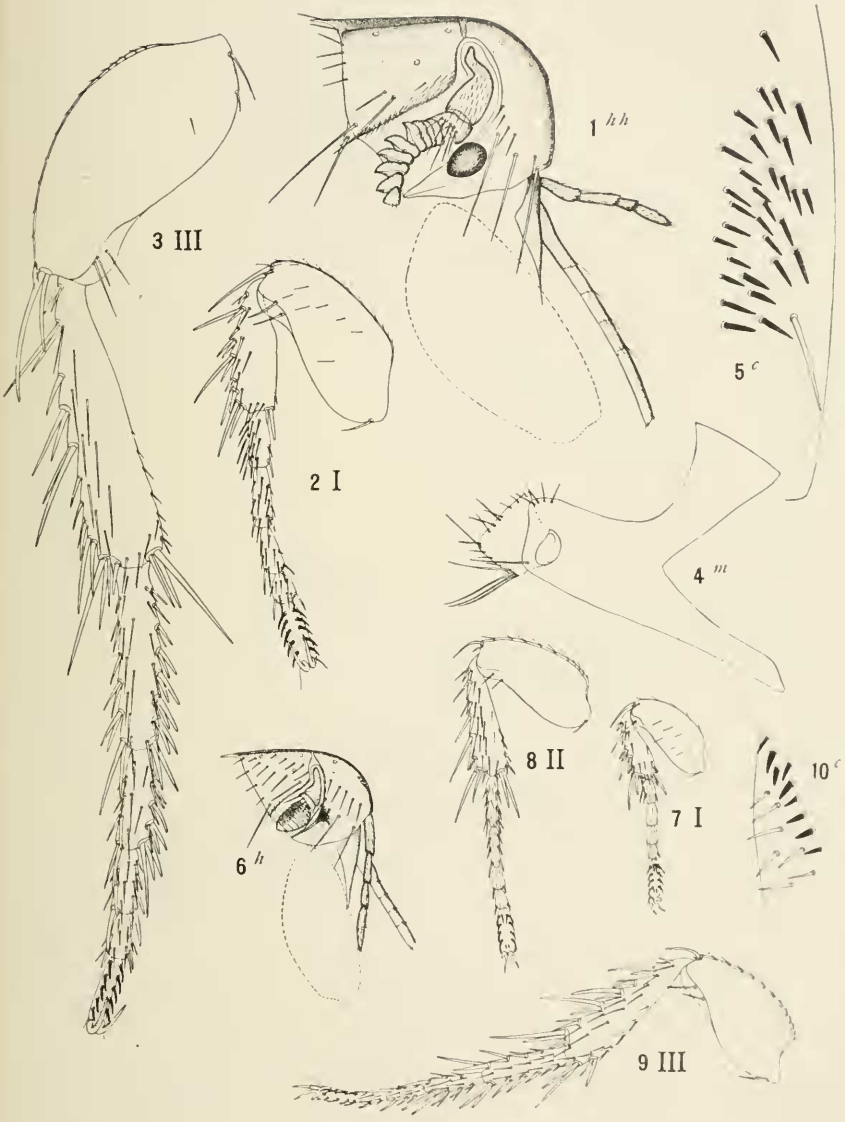

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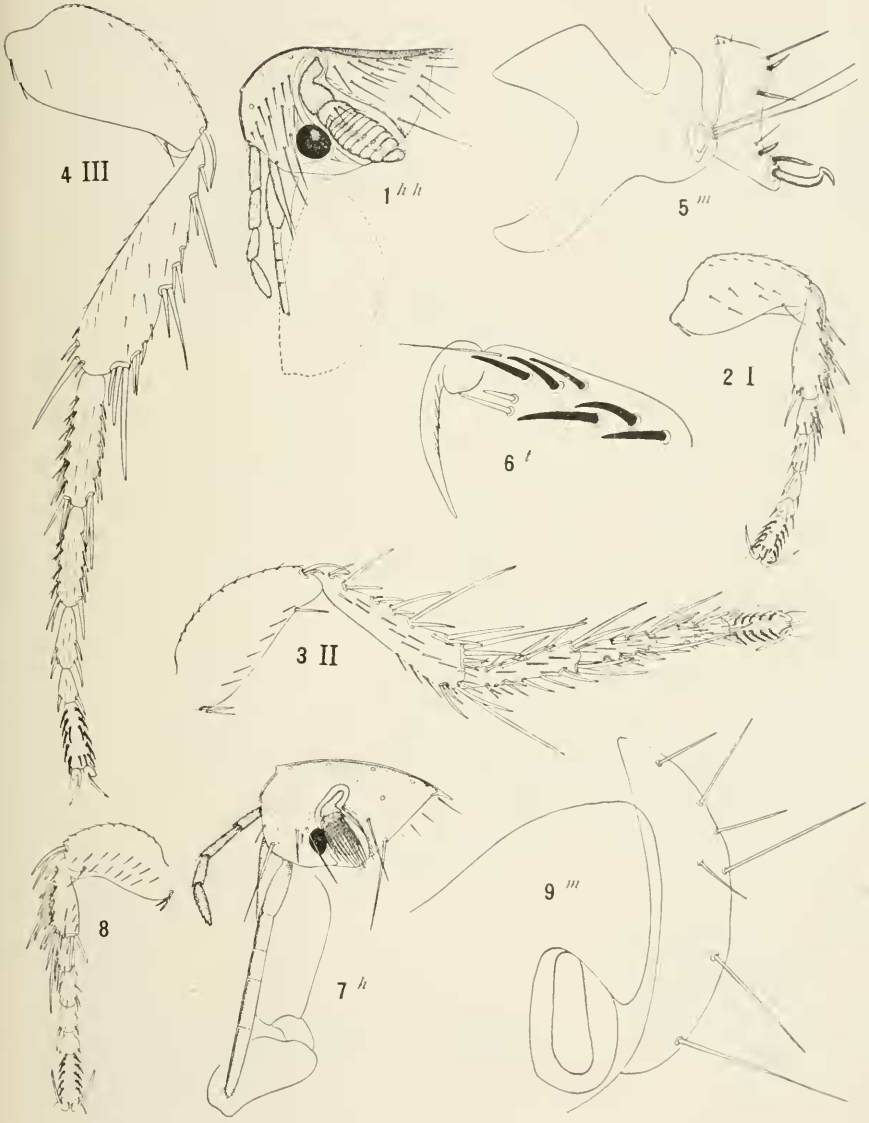

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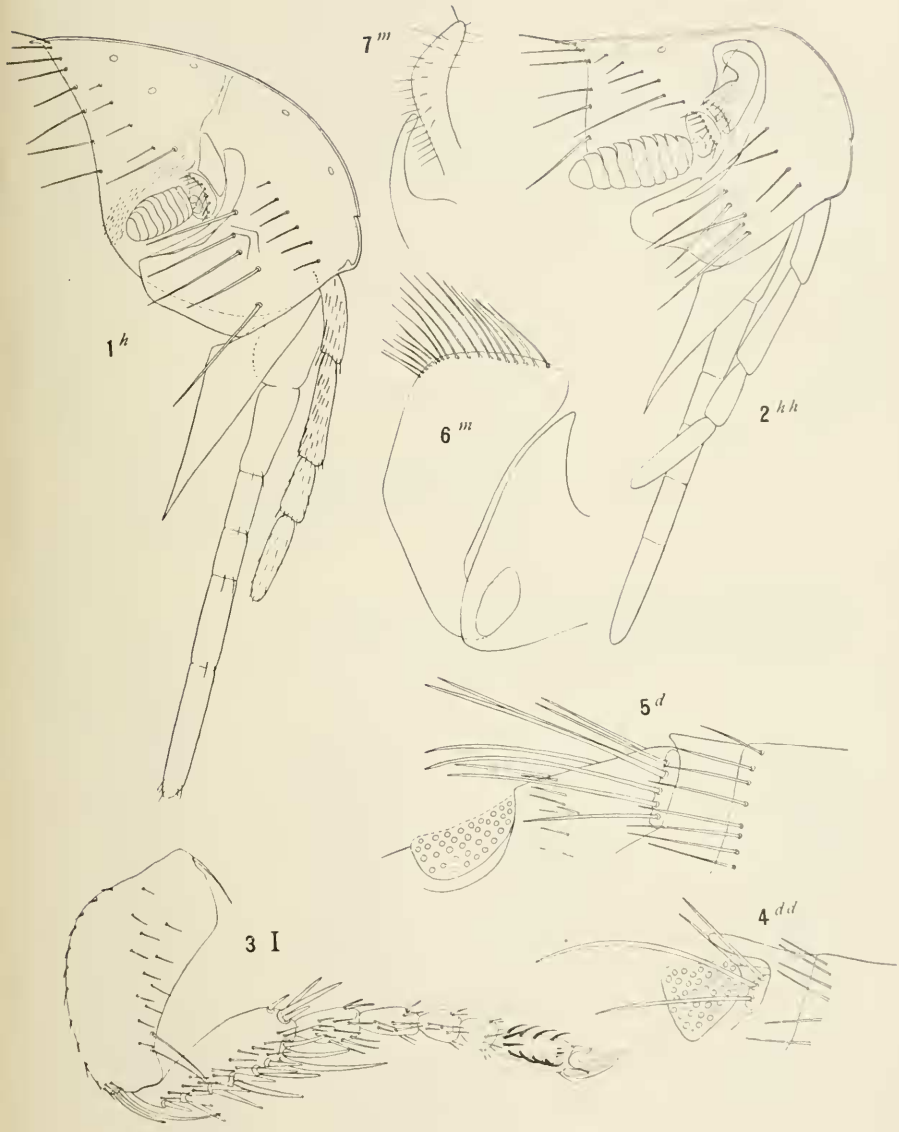

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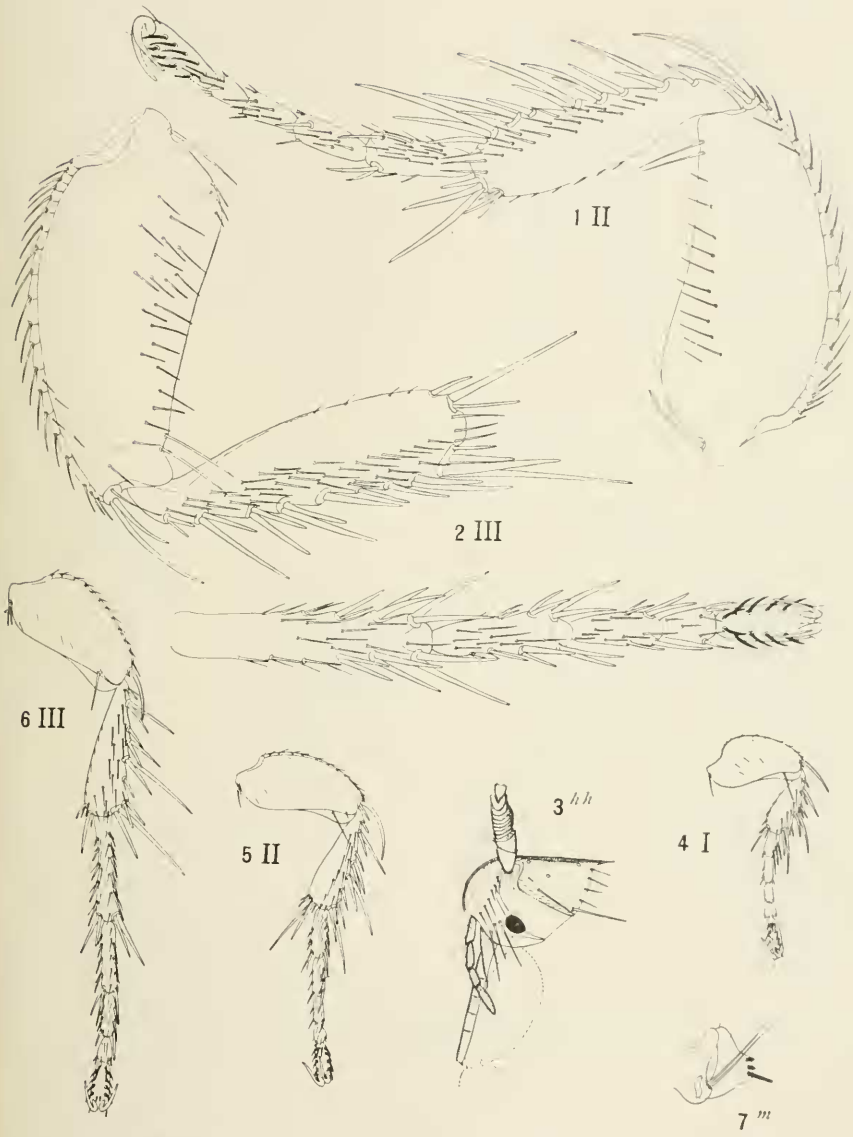

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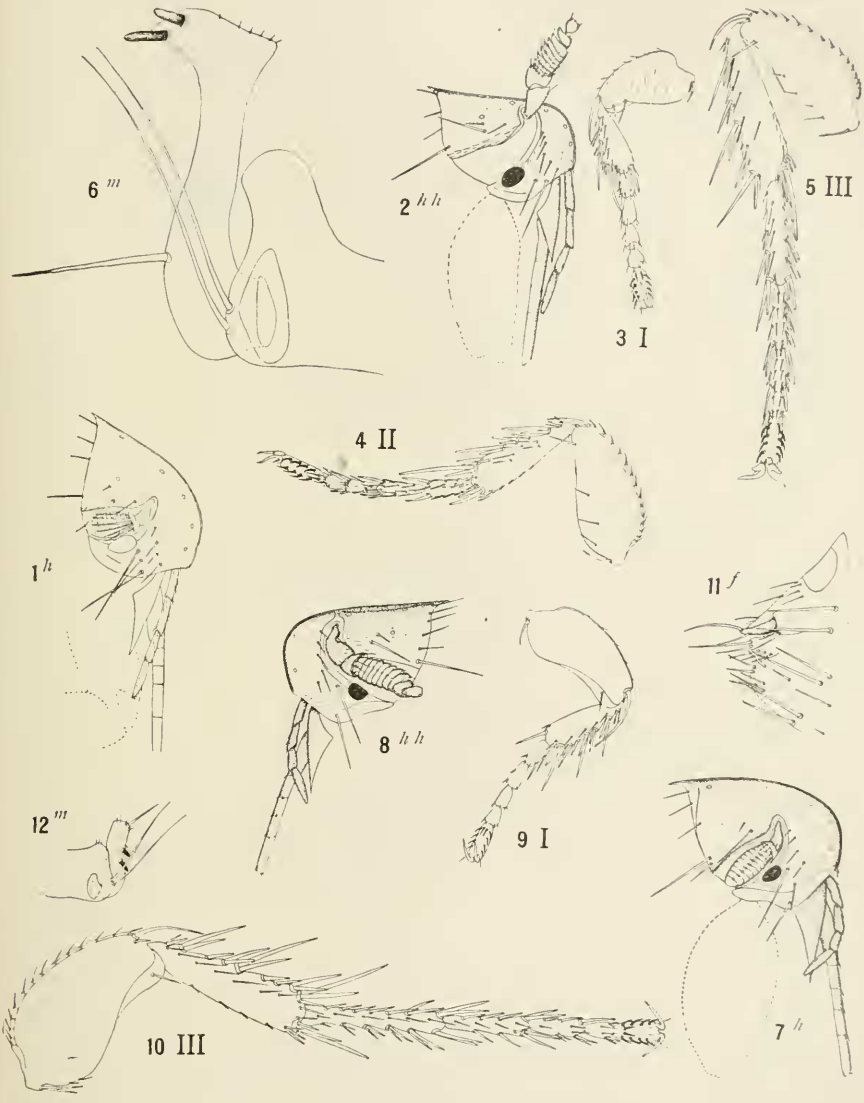

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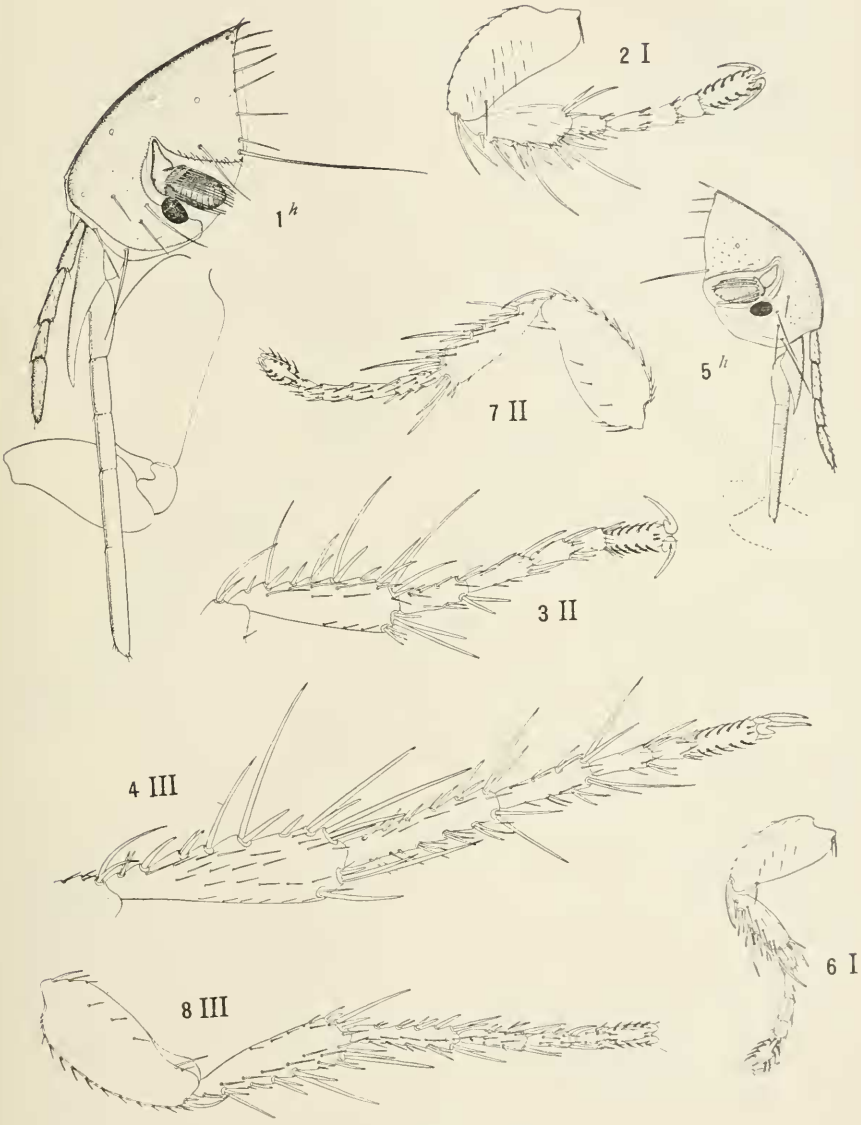

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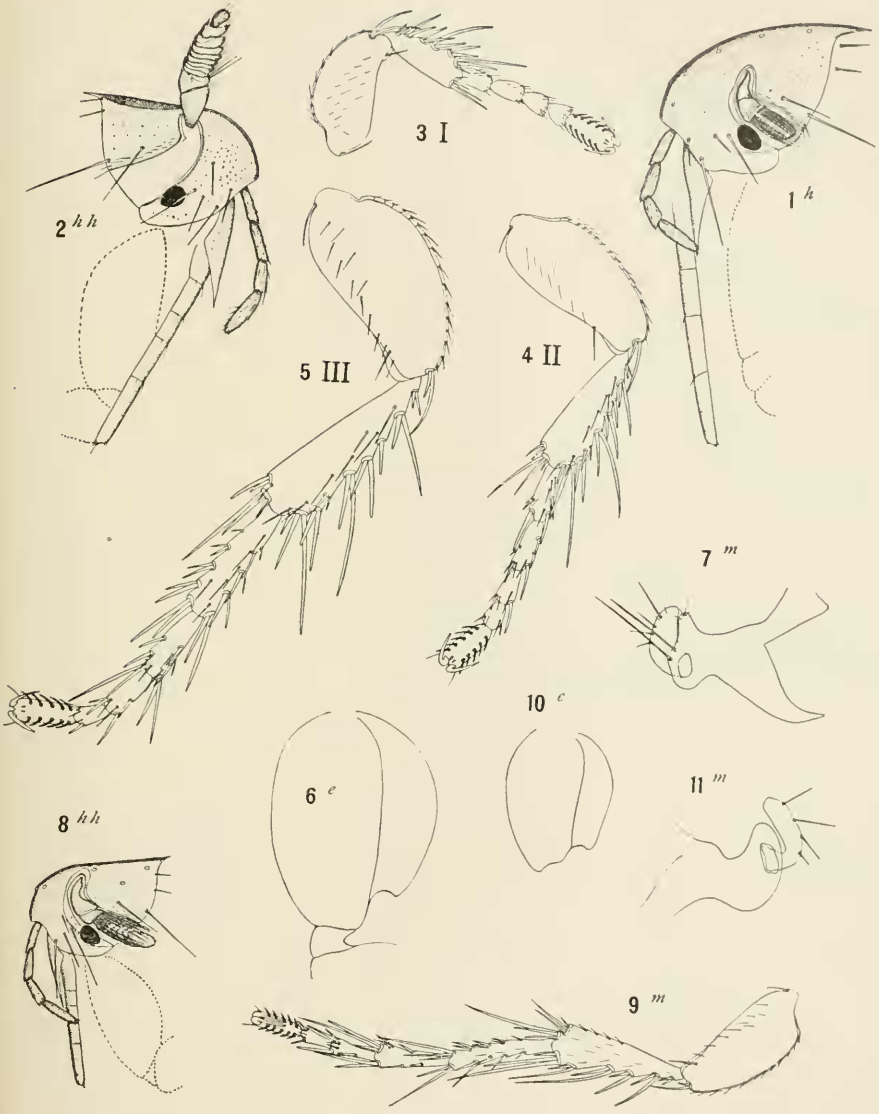

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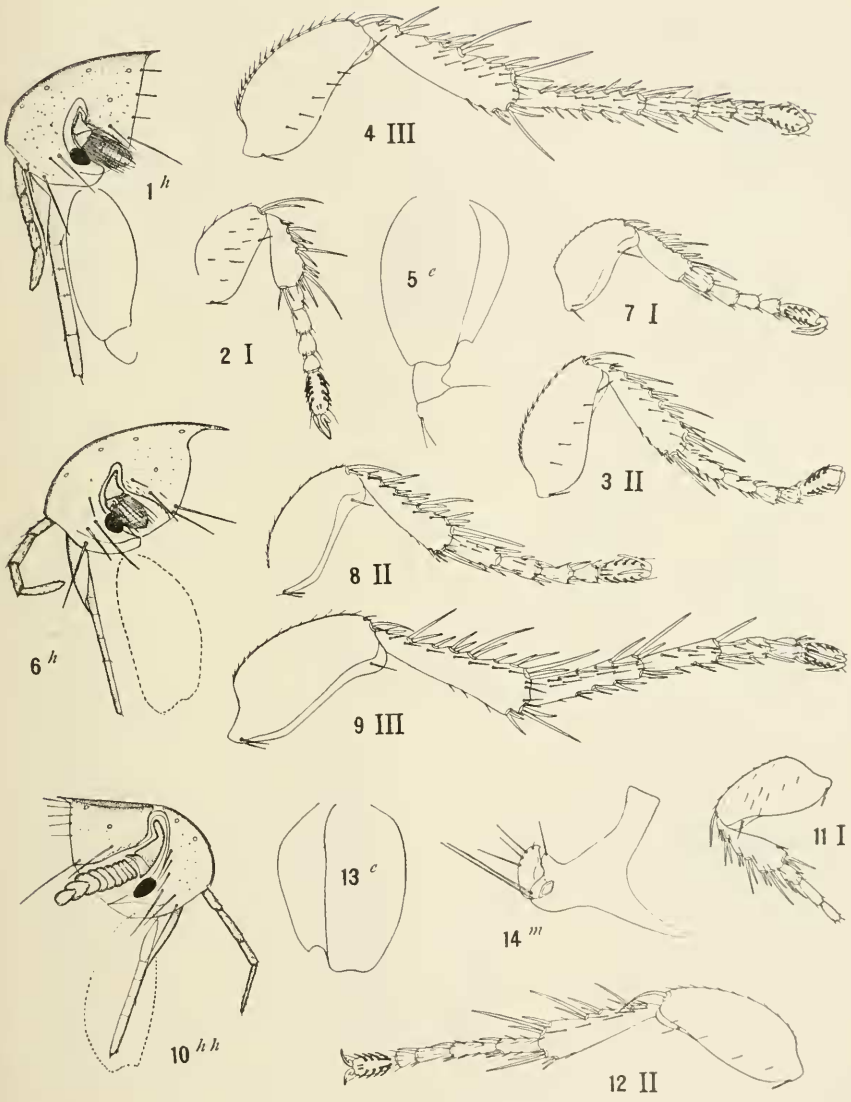

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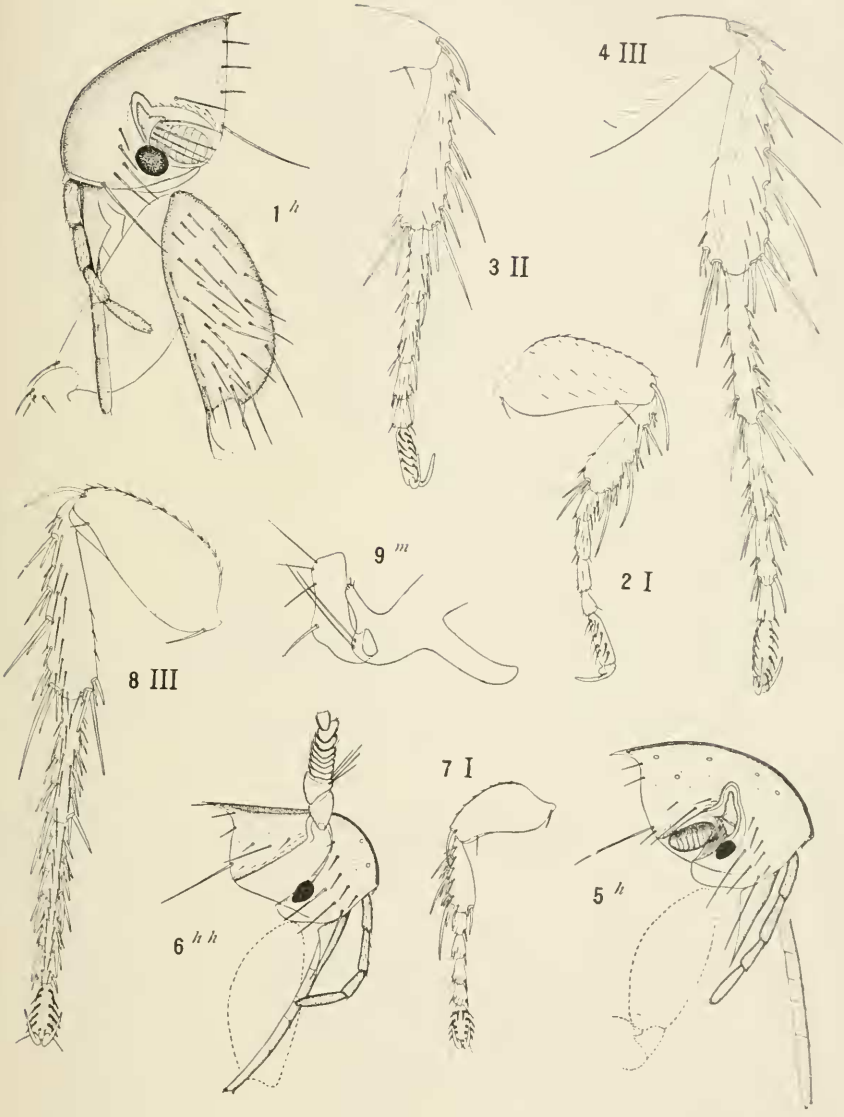

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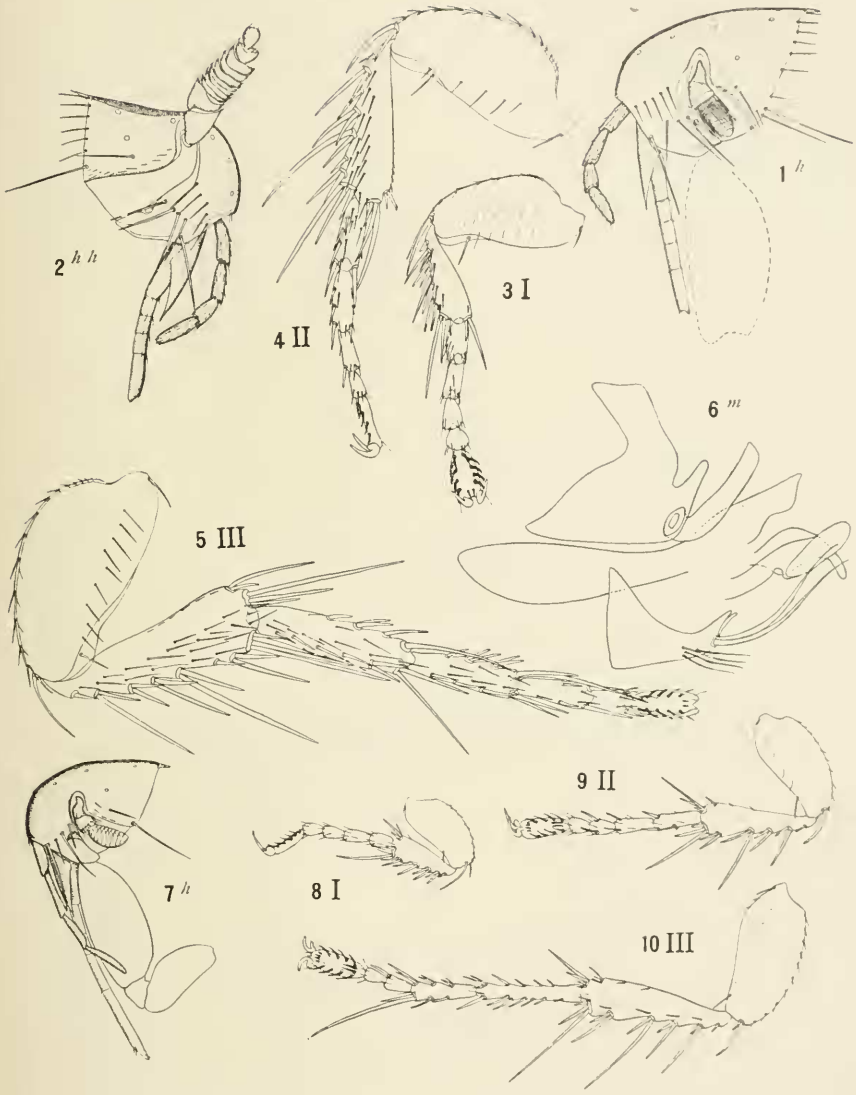

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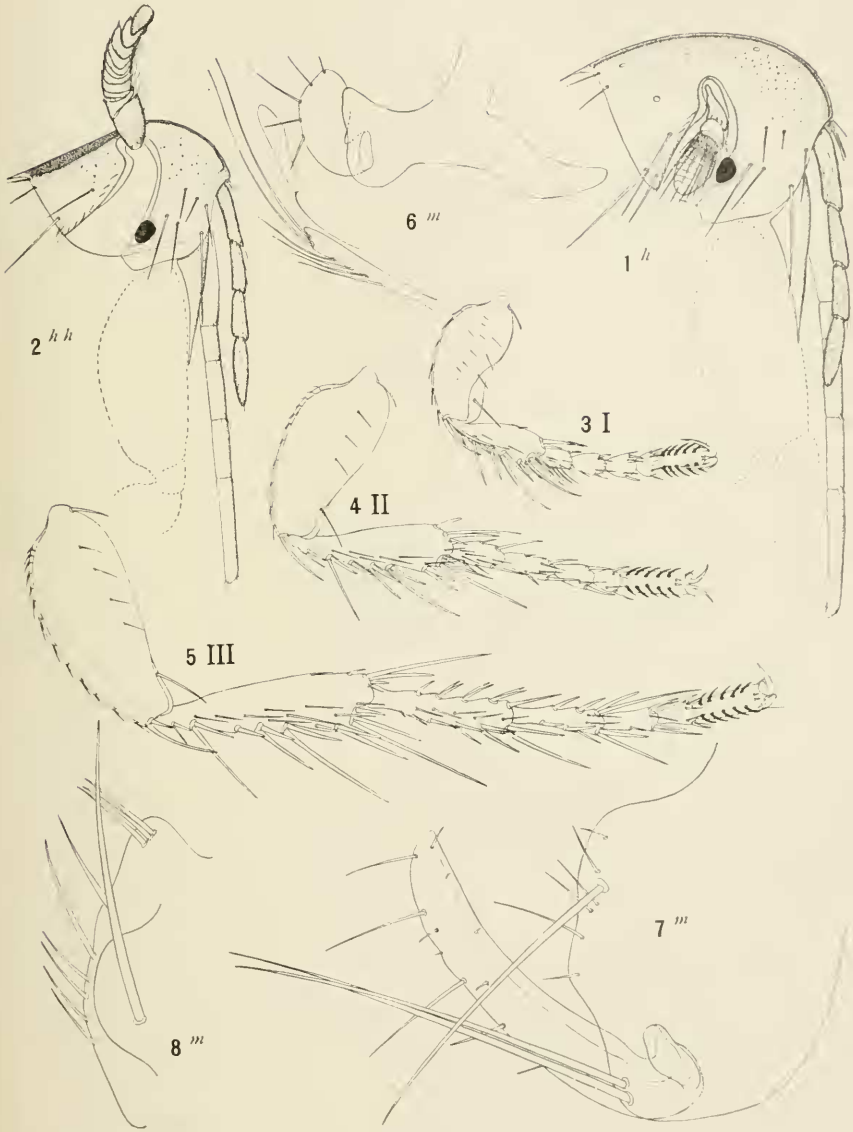

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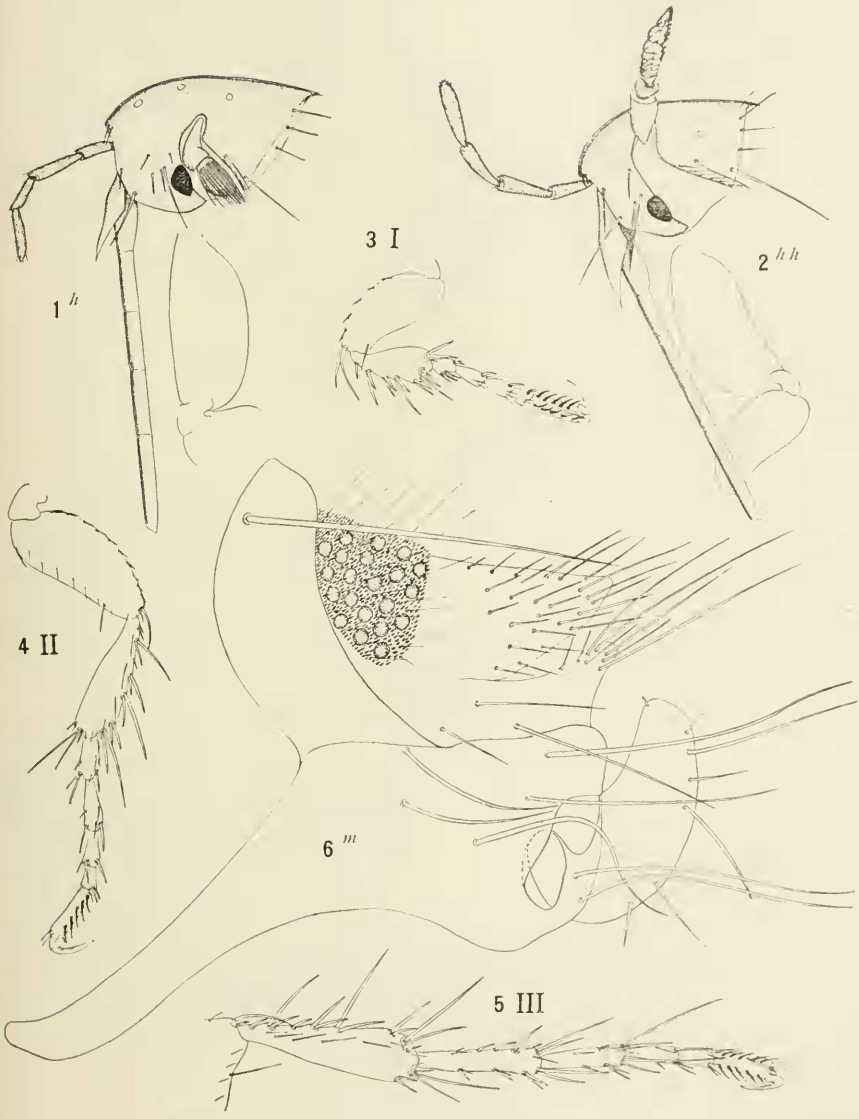
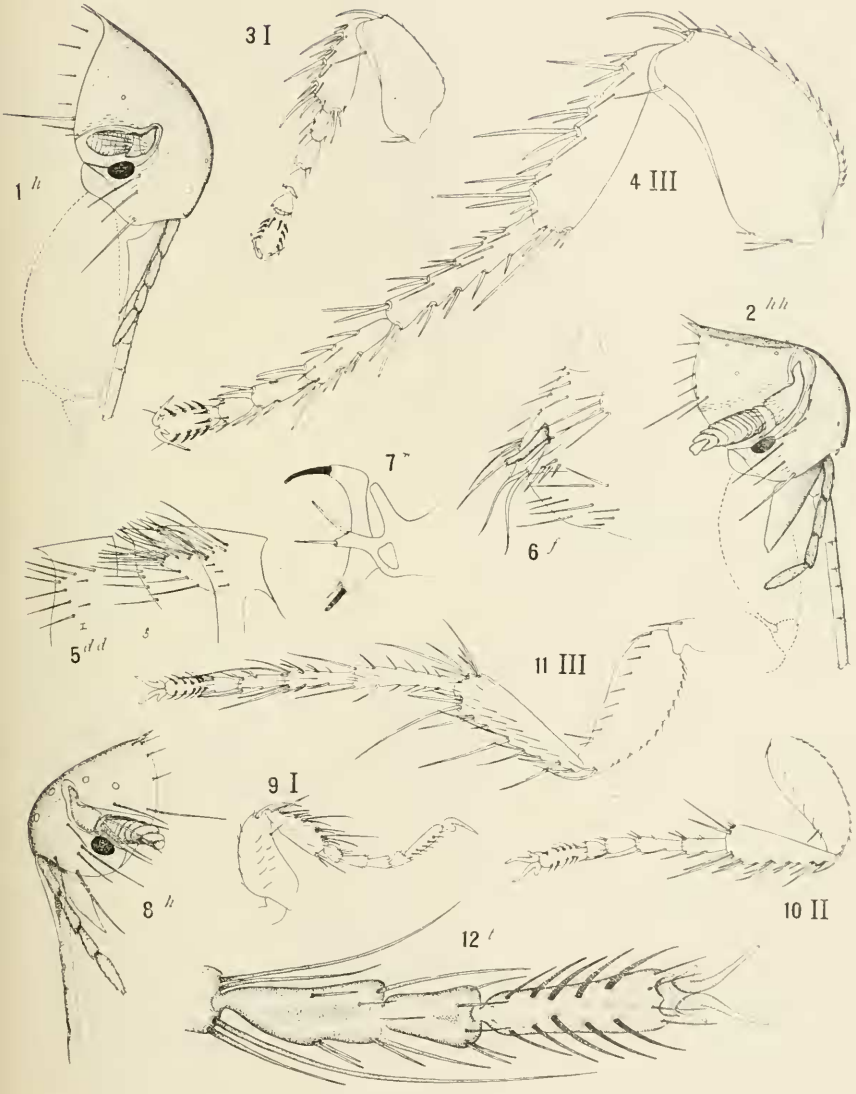


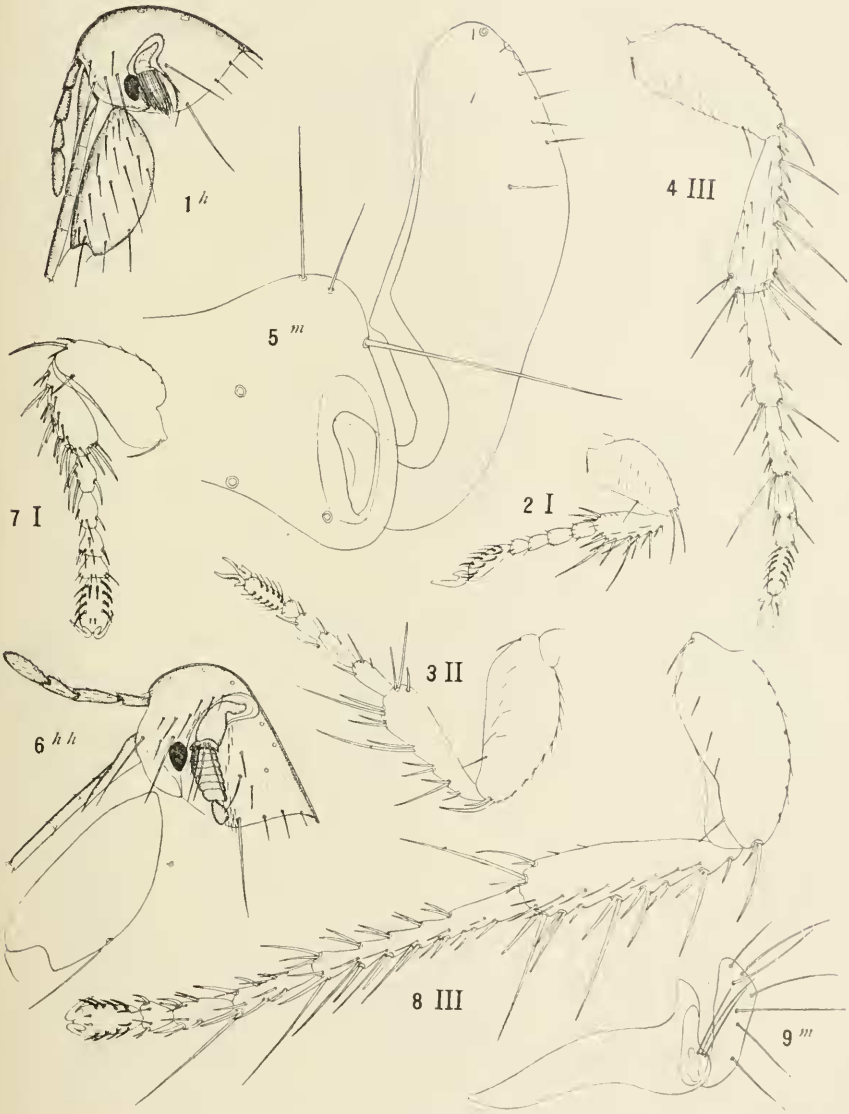
AMERICAN SIPHONAPTERA.

FOR EXPLANATION OF PLATE SEE PAGES 411, 415.



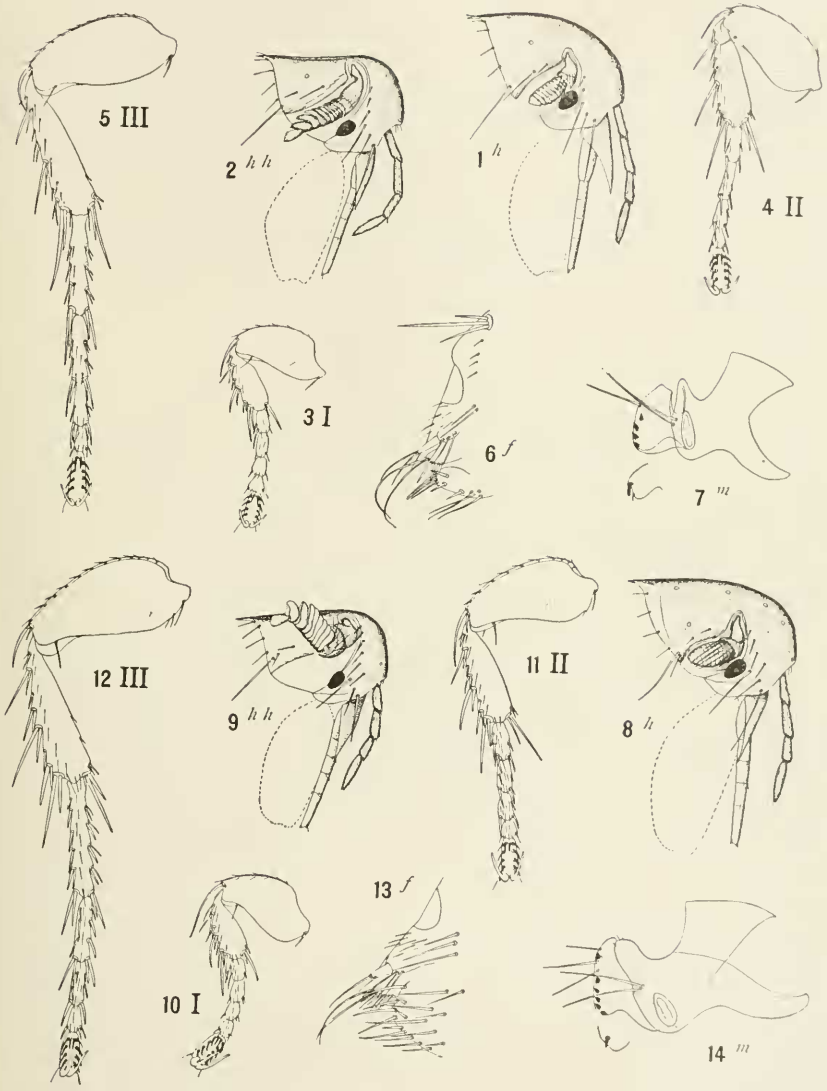
AMERICAN SIPHONAPTERA.

FOR EXPLANATION OF PLATE SEE PAGES 399, 415.



AMERICAN SIPHONAPTERA.

FOR EXPLANATION OF PLATE SEE PAGE 413, 417.



AMERICAN SIPHONAPTERA.

FOR EXPLANATION OF PLATE SEE PAGE 403.